MILLING IN THE LATHE Part 2.

THE MODEL ENGINEER

Vol. 95 No. 2370 THURSDAY OCTOBER 10 1946 6d

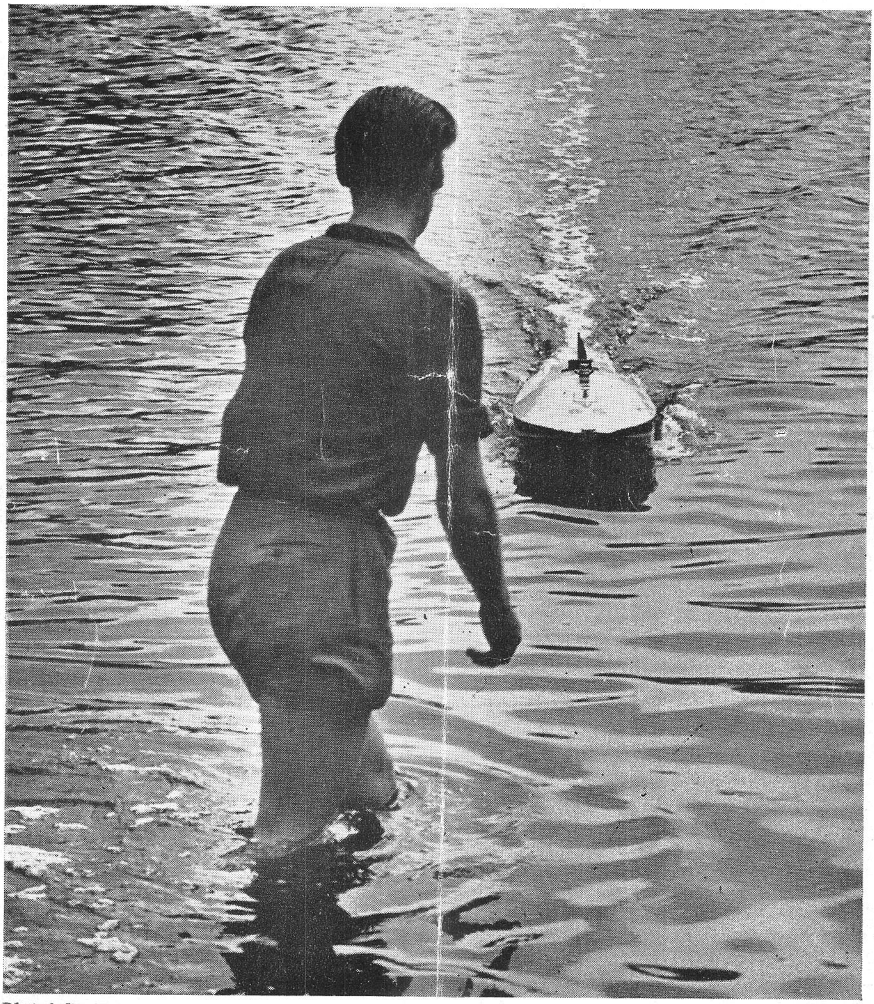

Photo by] [F. J. Standerwick

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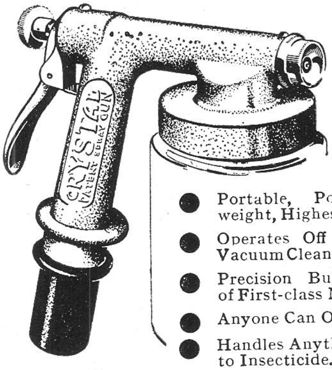

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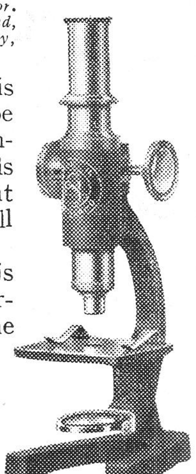

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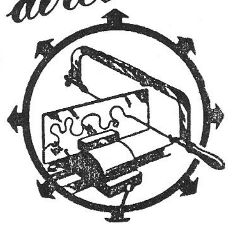

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THE MODEL ENGINEER

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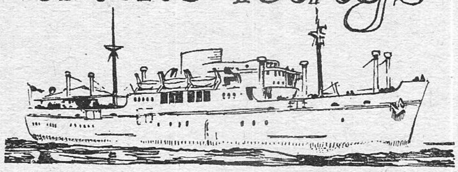
VOL. 95 No. 2370. OCTOBER 10th, 1946

Smoke Rings



Exhibition Journeys

MY reference to a visitor's 4 a.m. start from Worksop to reach the Exhibition by 10 o'clock, has brought me several stories of similar early rising. The palm must, I think, be given to a lady, Mrs. Wilson, of Burton-on-Trent who very bravely got up at 3 a.m. to prepare a flask of tea and some sandwiches to sustain her husband on his journey. He left home at 4 o'clock, collected two members of the Swadlincote Society, of which he is President, motored to Derby, then train to Trent and on to London by the 6.10 train. This little party spent four hours at the Exhibition, and then toured the principal sights of London, finally arriving home again at 11.45 p.m. Mrs. Wilson, bless her heart, was waiting with a good hot supper! Her husband writes: "If there is another Exhibition next year we will gladly get up at 3 o'clock to be there!" Another lady, Mrs. Alan Hodson, of Preston, does not mention any train time, but says she and her husband took four days off from their work and journeyed 210 miles to London specially to see the show. She says: "Believe me, it was worth every mile we travelled." One more list of adventures comes from Mr. D. N. Steen, of Bentley, near Walsall, who brought a party of thirty-five. The gathering of the clan began at 4 o'clock, and the collective start at 6.30 o'clock. Most of the party had been working on a night-shift from 8 p.m. to 6 a.m. After a fine day at the show they reached home at midnight in a deluge of rain. Mr. Steen says he met his friends again on the Monday morning, since when they have all been talking about the wonderful show and wishing they could repeat their visit. He predicts that next year the whole of the works will come. What a splendid reward all this enthusiasm is for those of us who have taken part in the organisation of the show. Your pleasure, readers of mine, is ours.

Bombay Progress

I AM pleased to hear from Mr. M. P. Polson, Chairman of the Bombay Society of Model Engineers, that in spite of the present unrest in India, his Society maintains a healthy rate of progress. The third annual exhibition of the Society was a pronounced success and drew a personal commendation from Sir John Colville, the Governor of Bombay. The Society is in a very sound position financially and now issues its Monthly Bulletin in a 32 pp. printed form, thanks to a special concession from the Paper Controller. The current issue contains articles on the work of Richard Trevithick, on model railways and model shipbuilding, on electrical equipment, and on workshop subjects. To encourage practical work among the members, quarterly competitions are being arranged, for which attractive prizes are being offered.

David and Goliath

A RECENT issue of the *Paignton News* contains a striking photograph of a miniature showman's traction engine towing a 10-h.p. motor car. The tractor is a fine 2-in. scale job, built by Mr. Charles Bedford, a radio service engineer of Brixham, who, in the photograph, is happily seated on a trolley driving his engine. The local excitement at this unusual demonstration was intense. I met Mr. Bedford at our Exhibition and learned that he is now making a 5-ft. petrol-driven model T.B.D. He did not say if he had visions of his boat one day towing the *Queen Mary*.

A Model Car Film

A VERY interesting film showing the activities of the members of the Pioneer Model Racing Car Club has been prepared by the Shell Marketing Co. Ltd. under the title of "New Hobby." A private view of the film was recently given at Shell Mex House, Strand, W.C.1, and aroused much enthusiasm by its well-prepared presentation of the exciting aspects of this growing hobby. The sound track adds considerably to the realistic effect of the car racing. Readers who are interested in this new model sport may obtain further details of the film and of the Club from the Hon. Secretary, Mr. H. J. Lamb, 39, Vyner Road, Acton, W.3.

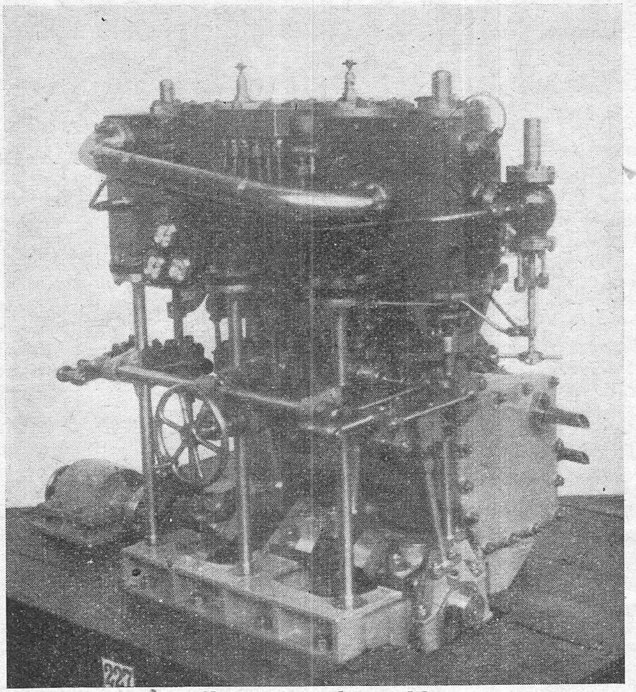
Rejuvenation

A WEST LONDON reader writes :—"I went twice to THE MODEL ENGINEER Exhibition, and took my old Dad the second time. He is 82 years old. You should have seen him when he came out, he was about fourteen!" Model engineering certainly keeps you young.

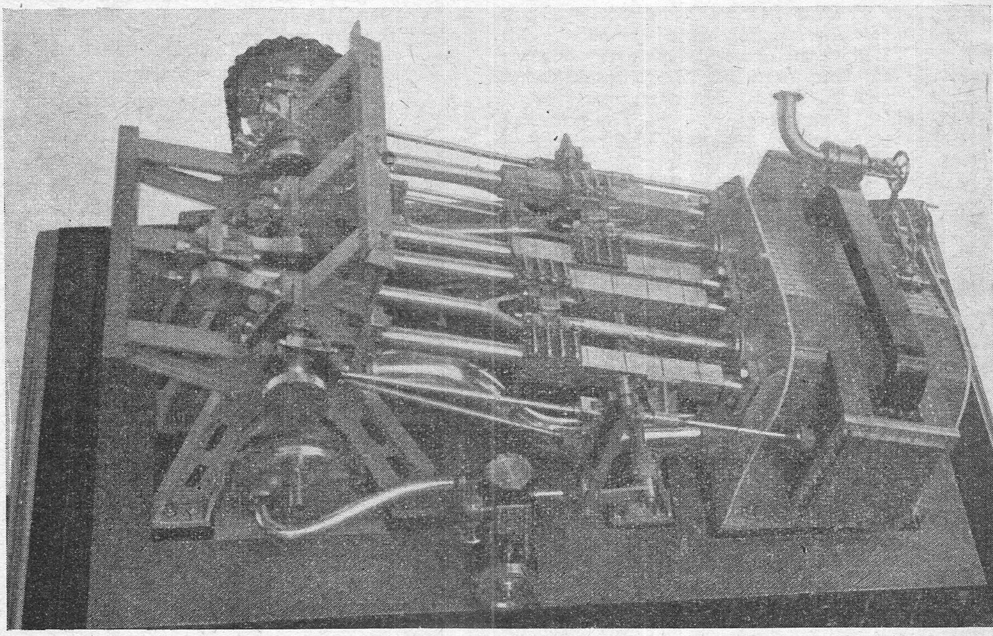
Percival Marshall

W. R. DUNN'S IMPRESSIONS OF THE GENERAL ENGINEERING MODELS

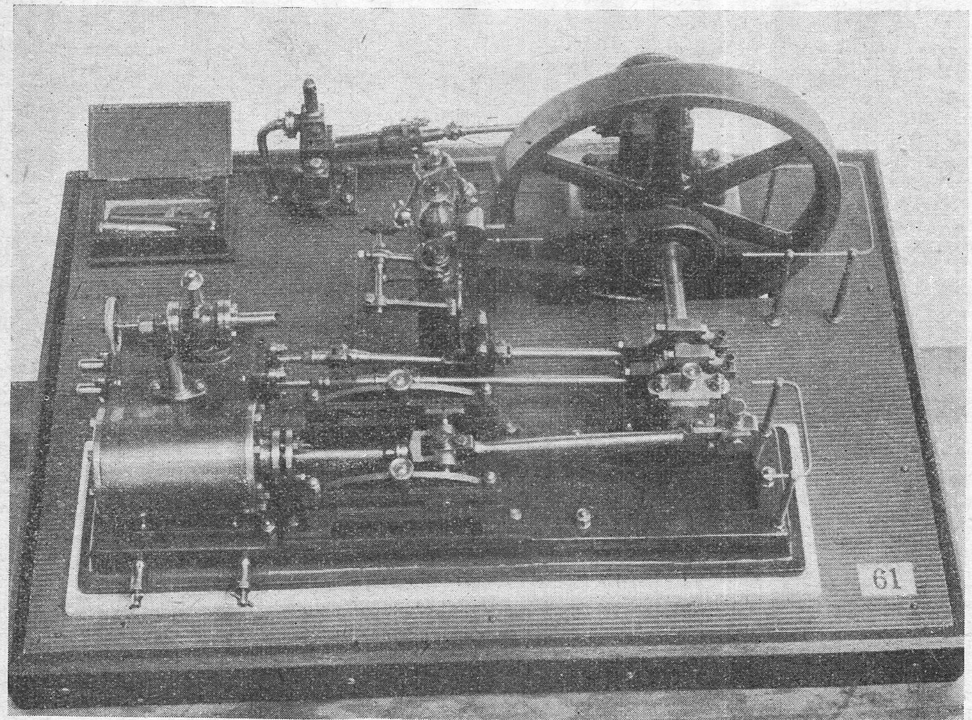
IN reviewing the Exhibition engineering models generally, both stationary, road, and rail locomotives alike, I think great commendation is due to competitors of all classes at this year's show, for the excellent work they exhibited. Really good work was prolific, whilst the more indifferent or simple models were very few in number compared with former years. Indeed, the general high standard of workmanship in this twenty-first birthday of THE MODEL ENGINEER Exhibition, was a very pleasing compliment for this auspicious event. It is rather a pointer that to be a winner for any distinction in forthcoming exhibitions, a very high degree of workmanship and accuracy will have to be manifested, which quite rightly, should be everyone's aim. As for offending slotted screw-heads displayed in prominent positions, these, I am pleased to say, were



Always a popular model



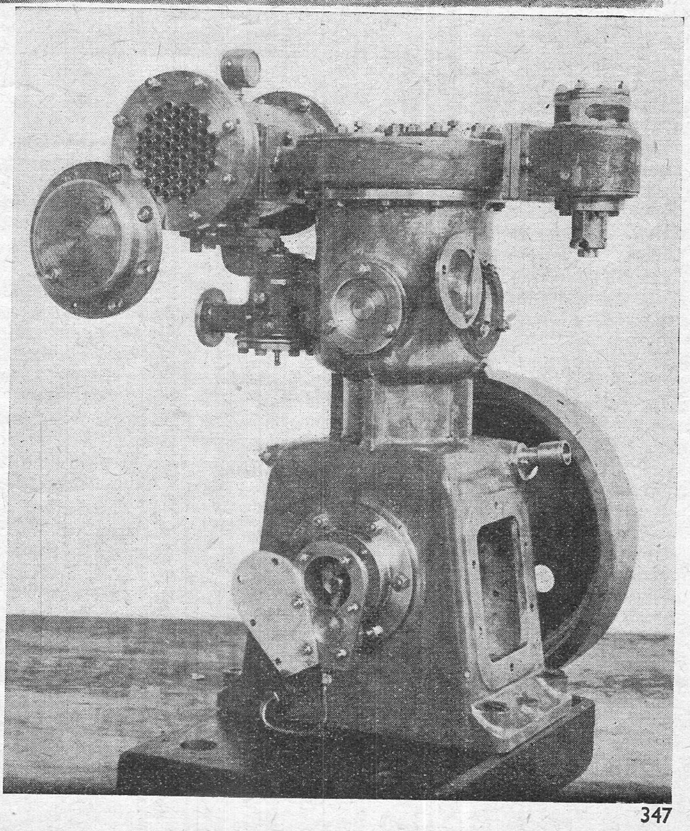
Good detail is apparent here !



An interesting model for a newcomer to copy

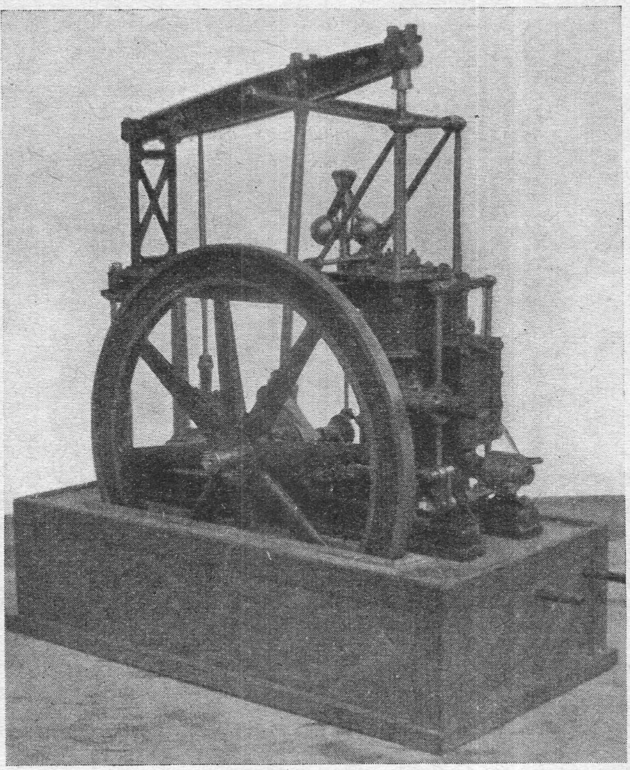
mostly conspicuous by their absence, having been replaced by the correct hexagon nuts or bolt-heads, as dictated by real practice.

The chief award went to Mr. S. R. Harris, No. 227 in Class 8 for his 1-in. scale compound condensing marine engine, which was a truly representative job, and well deserved the Silver Medal and prize awarded; much more so must Mr. Harris be complimented when it is revealed that he suffers the affliction of the loss of one eye. The Bronze Medal and Steven's Cup, won by Mr. E. B. Wilcox (one of our elderly competitors), for his diagonal compound condensing paddle engine, No. 3 in Class 8, was for a beautifully executed piece of work. Everything was perfectly to scale, only a few minor refinements were missing, such as big-end oil-wiper wicks; and oil sumps at the top end of the slide bars for the crosshead slippers to



Right: Just like the prototype

overrun, which would be an added improvement. Coming to Class 11, one of the best jobs was Mr. W. T. Rolls's model open-type vertical tandem compound engine and dynamo, No. 16. This type of plant being now practically extinct, it was a pleasant reminder of the past, especially the bi-polar dynamo, both having now been superseded by the high-speed forced-lubrication enclosed type engine with multipolar dynamo. It would be interesting if Mr. Rolls could let us know the steam consumption for the watts output, so that a comparison could be made with its small contemporary oil or gas engine-driven dynamo plant. A good picture of this entry was shown on the cover of THE MODEL ENGINEER issue of August 22nd, and it fully deserved the Silver Medal which it gained. An interesting exhibit entered by Mr. C. E. Shackle was his 1-in. scale Fowler double-drum ploughing engine, with four-furrow plough and anchor. This model, No. 22 in the catalogue, was well worth noting, as also was his Clayton & Shuttleworth traction engine and threshing machine, No. 21, which, incidentally, had actually threshed corn. One other model which stood out as a novel exhibit, was Mr. Amos Barber's little model Crossley horizontal Diesel engine, entry No. 71. Staged in its realistic engine house, representing the end of the factory building, it was shown with the main drive to the factory shafting seen coming through the wall box. The engine itself had all the detail parts, such as fuel-injection pump, governor, etc., all to scale size, as would be found on a 100 h.p. engine. The engine house was complete with compressed-air starting reservoir, fitter's bench with vice and tools, altogether a very pleasing exhibit, being awarded a Very Highly Commended Diploma. The engine was described last year in THE MODEL ENGINEER and actually works on the hot-air principle.



An old timer

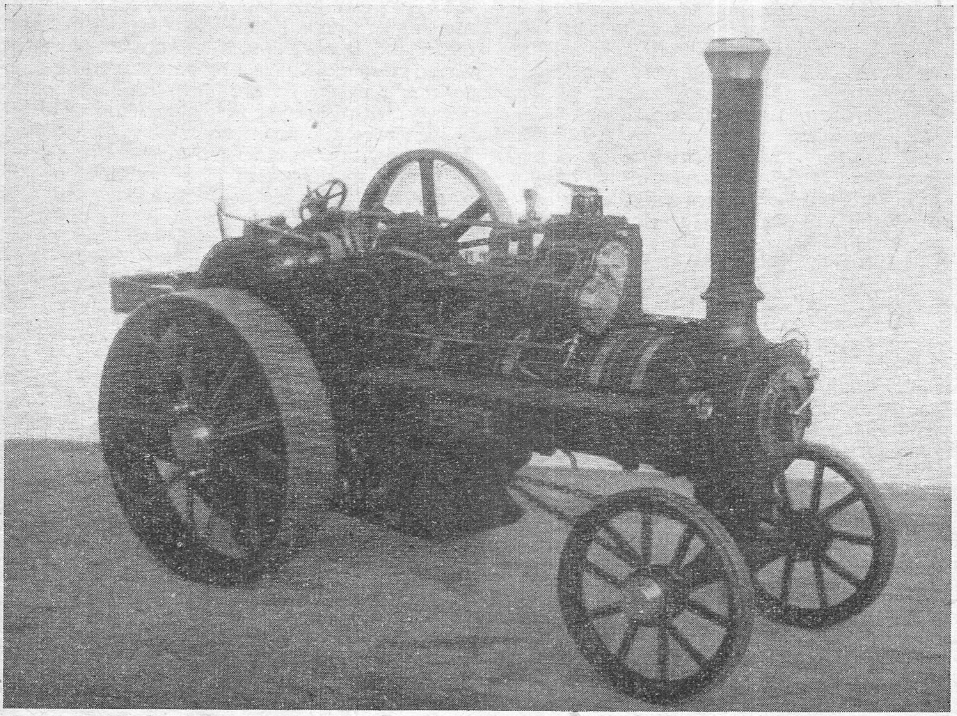
Guns were rather well represented this year, one of the best being the muzzle-loading gun, entered by Mr. J. Mendez, No. 62, another of our elderly entrants, and a well-remembered former competitor for many years. Entailing a good amount of close detail, it was awarded a Highly Commended Diploma, as were two model naval quick-firing guns, both being beautifully executed, one by Mr. S. A. Walter, No. 126, and the other by Mr. A. K. Pope, No. 51, and the fourth one by Mr. C. Q. Preston, a, model 4-in. naval gun, No. 137. A very neat model of a mill engine, of the period about 1880, was entered by Mr. S. E. Stevens, the donor of the Stevens Cup. No. 61 in the catalogue ; it is shown in our photograph, and was fitted with automatic expansion valves, the cut-off gear being controlled by a Porter governor ; altogether a very praiseworthy piece of work, which succeeded in gaining a Highly Commended Diploma. The Silver and Bronze Medals in this class were awarded to a model 1½-in. scale binder and reaping machine, No. 122, by Mr. A. Bielby, and a "Shand, Mason" horse-drawn steam fire-engine, No. 52, by Mr. H. S. Goodman. The former was a complicated piece of work and quite obviously deserved its award. The fire-engine, an absolutely scale job, and now of historical interest, was well worth the Bronze Medal allotted to it.

An attraction seldom seen at our competitions was the one-fifth scale model of an Allen & MacLellan, high-speed two-stage air compressor, by Mr. H. McCall, No. 135. As a working model, this machine was really a fine job ; fitted with intercooler, and all the prototype auxiliaries, crankshaft, forced-lubrication oil pump, air strainer and unloading valve, it could be easily taken for the full-size compressor by reference to the photograph. Another well-executed and excellently finished job, was Mr. S. W. Simpson's 2 in. × 2 in. reversing single-cylinder launch engine, No. 273, to the maker's own

design ; its proportions were correct in all details.

Continuing the models in Class 11, the 1-in. scale model "Grasshopper" steam engine by Mr. W. L. Rowson, No. 139, was an interesting type to reproduce from an historical point of view, and a photograph of this model is shown. There were points, however, about this entry which had doubtful features, the worst being that it had only one very short main bearing to take the large bending moment of the overhung crank, and the heavy flywheel on the opposite side. At least an additional footstep bearing should have been provided at the outside of the flywheel. It is also debatable whether the type of big-end brasses shown were common practice at that period. The model obtained a Highly Commended Diploma. The built-up plate-frame horizontal engine, with reversing gear and shaft governor, was an interesting type seldom seen, entered by Mr. K. N. Harris, No. 198, being awarded a Highly Commended Diploma.

Coming to the traction engines, Class 13, we had a good entry of these this year, and they were all of a very high order in workmanship. The Bronze Medal winning job by Mr. H. Evans, No. 39, a 1-in. scale MODEL ENGINEER traction engine with two-speed gear, was an excellent job, and well deserved its award, while Mr. Howard's engine, No. 239, of similar type, came exceedingly close for quality of workmanship, having a Very Highly Commended Diploma. Both models were fitted with gear-cases (not always in evidence), the detail work, and riveting, were extremely good. Another splendid traction engine was Mr. E. G. Bettles' 1½-in. scale engine, which had a mass of detail, as can be seen in the photograph. Moreover, it was a Burrell single-crank *compound* job, the two cylinders being clearly visible in the picture. It was shown with a Garrett 54-in. threshing and finishing machine with Garrett straw elevator, and obtained a Very Highly Commended Diploma. Mention must also be made of the large 2-in. scale "Fowler" traction engine, by Mr. G. T. Williams, No. 96. Capable of hauling the driver on the road, it had good detail and equipment, and was awarded a Highly Commended Diploma. On the other hand, we had quite a small showman's traction engine, ½-in. scale, a beautifully executed little job, and no easy one, for a working model. It was entered by Mr. P. J. Todd, No. 108, who has been a regular contributor to our shows for many years. It displayed many good points. Similarly, the working model of a L.P.T.B. type HR2 bogie tramway car, entered by Mr. F. E. Wilson, No. 264, was a close reproduction of its prototype, and was a carefully executed piece of work. A similar very good job by Mr. R. L. Walker, No. 147, a ¾-in. scale model of a double-deck motor bus, obtained a Highly Commended Diploma, but this was not a working model. The top prize in this class was won by a very fine model of a London Fire Brigade 100-ft. steel turntable-ladder fire escape, as made by Messrs. Merryweather, of



Really true to scale

which it was truly representative, and well deserved the Silver Medal awarded to it. In this class was also exhibited four Aveling $1\frac{1}{2}$-in. scale road rollers; these were described, it will be remembered, in back numbers of THE MODEL ENGINEER, with full working drawings by Mr. Westbury, the best entry being by Mr. C. T. J. Nichols, No. 136, and was awarded the Aveling prize and a Highly Commended Diploma. With a wealth of detail, even to a scarifier, with the road picks, and other refinements, it very easily won its award. Mr. L. R. Stephens's road roller, No. 64, with not quite so much detail, but almost equal workmanship, was awarded a Commended Diploma. A further novel entry in this class was a passenger-carrying 'bus, by Mr. F. Renshaw, No. 5, capable of seating about half a dozen small boys, one of which acts as the driver, being pedal-driven through a gearbox. The 'bus, painted in the regulation fashion, is to be used in a Rugby recreation ground. It did not apparently get any award, but it had utility characteristics.

From the remarks of visitors, the Exhibition this year was very much enjoyed, many saying, that from point of view of interest, it was hard to beat anywhere. In closing, I would like to make special reference to the altered method of judging this year, which has been a little disturbing to some of the competitors, especially those who have entered work in our previous shows. Formerly, each individual job was judged on its own particular merit, that is, if the entry was considered, on all points, worthy of a Silver or a Bronze medal, it was thus awarded, regardless of any qualities that a competing model may possess likely to raise or lower its distinction. This year, however, this discrimination has been altered, all work being divided into classes, and each job being graded against its neighbour to assess its award. The best model in any class therefore had the highest award. Now this acted rather harshly on some competitors, because in the case of the class having a large number of entries, it was far more difficult for a good model to get a high award, as compared with a class having a small number of entries. For instance, where it took a very elaborate or complicated model to get a medal in the former class, a medal would be much more easily won in a class where few entries were made, and where perhaps less pretentious work was to be found. Reflecting on some of the competitors' remarks, I cannot help thinking that the new system of judging is likely to lead to disappointment from competitors in the various classes. Mainly for this reason I am of opinion that the individual merit system of judging (except, of course, in the case of the Championship Cups), is the most acceptable one, if it is our object to encourage the entering of models at THE MODEL ENGINEER Exhibitions, which have proved themselves such popular and inspiring shows both to the public and model engineers alike.

BENDING SHEET METAL

By A. WILLSON

I HOPE that the following method of bending sheet metal will prove useful to fellow model-makers. To begin with, a scorer will be required. This can successfully be made by heating up an old flat file and then bending over the end to form a hook, as shown in diagram A. It should now be filed into shape, for right-handed workers, the left-hand side of the tang (when the point is downwards) must be filed flat similar to a safe edge file. This edge is worked along the edge of a rule in order to get the score lines straight. Now file what is the cutting edge into an angle of just under 45 degrees. Diagram B will make this clear The tool should now be hardened and tempered in the usual way, *viz.*, made red hot and quenched in water.

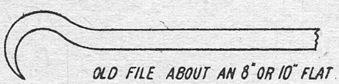


Diagram A, Scorer

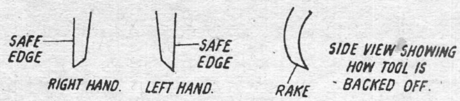
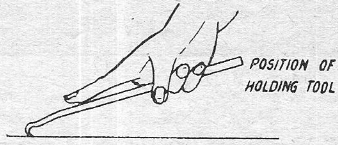


Diagram B

We now need to make another and similar tool (diagram C), both sides this time being just over 90 degrees. This is for opening out the depth of the initial cut, and to get both angles alike.

We proceed now to carry out the bending operation. Having previously scribed the metal at the place where the bend is to come, we follow this line with tool number 1, the "scorer," using it in conjunction with a ruler, of course. Do not bear too hard at first, but cut about half-way through. Now use tool number 2, the "opener," inserting it in the groove already made and scoring until both edges are alike. A dull line appearing on the underside of the sheet of metal means that you have cut deep enough, and the actual bending should now commence. When bending, care must be taken to see that the sheet is not bent over the 90 degrees mark, otherwise it will snap. Diagram D shows the final stages, a clean neat bend ready to take solder for strengthening.

Diagram C, Opener



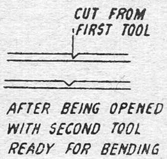
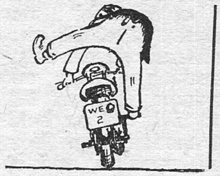


Diagram D

AN OBSTINATE ENGINE

by

"1121"



AT the end of July, 1945, the writer acquired a B.S.A. motor-cycle, 595 c.c. side-valve sloper, of 1935 vintage. It was in beautiful condition, outdoing many 1939 bikes in personal appearance, and, after attention to a few minor details, was put into regular use. After about a couple of months' running, the engine began to develop "eight-stroking" when coasting down hills against compression—regular, persistent eight-stroking, which could only be eliminated by retarding the ignition.

The writer works with a number of motor-bike experts whom we will personify collectively under the name of "Jim." Jim had advised and assisted in buying the bike and putting it on the road, and was consulted concerning the eight-stroking.

"Mixture too rich" was his verdict. "If you look on the side of the carburettor you will see a little screw with a spring under the head. That's the air adjustment to the pilot jet. If you unscrew that a little bit it will weaken the mixture when the throttle is nearly closed, and cure the trouble."

We hunted out the screw, and undid it a bit, and then a bit more, but it made no difference. We reported to Jim.

He said "Pilot jet bunged up." We took the

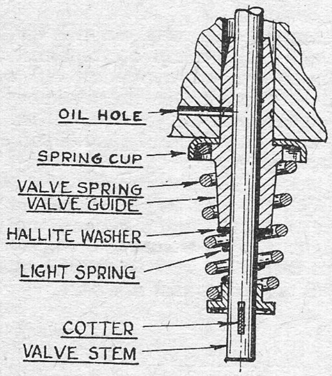


Fig. 1

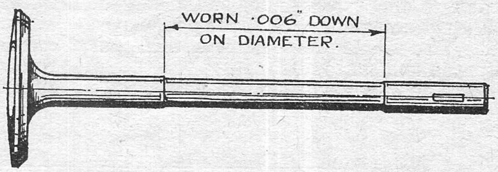


Fig. 2

carburettor to bits. The pilot jet wasn't bunged up, but we unbunged it all the same. Still no result.

Jim said "It must be the needle-jet worn large." We couldn't see how that would affect slow-running, but Jim said "Oh yes, it would allow extra petrol to come through, besides what's coming through the pilot jet. Get a new needle-jet."

So we got a new needle-jet, and a new needle while we were at it. 4s. 6d. No difference.

Jim said "It's the float needle. It's worn, and not shutting off properly. See if its got a groove round it." So we had a look at the float needle. It had a groove round it. We got a new one. 1s. 6d. No difference.

Jim now thought it might not be that at all, but the throttle slide might be worn. We had a look at it. It did seem a bit sloppy, so we built up the jet block with solder in sundry places until the slide was a better fit, and put it all together again. No difference.

Jim was getting desperate. He said "Let's see what the carburettor people say about it." He dug out an Amal leaflet. This was helpful. It told us to do most of the things we had already done. It gave us a list of all the symptoms of rich and weak mixtures. Under "rich mixture," among other things, it gave "four-strokes, eight-stroking." We thought "Ah! At least we're on the right track, but what else can we try to eliminate rich mixture"? We tried everything again. We had another look at the Amal leaflet. We came to a bit which said "If weakening or enriching the mixture does not improve the running, the trouble is not carburation at all, but elsewhere." We looked up all the books we could lay hands on. They all said the same thing.

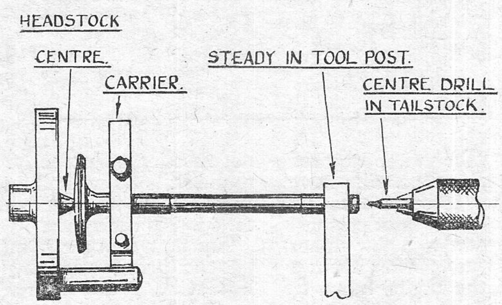
Jim said "Well, it must be ignition. Check up the timing." We checked up the timing. It seemed to be all right. "Clean the contact-breaker points," said Jim. We cleaned them. "Clean the contact ring behind the contact-breaker." We cleaned it. "Wrap a bit of rag round something and poke it down the hole in the magneto body where the high-tension lead plugs in. Then turn the engine over, and that will clean the slip ring." We did all that, and got an electric shock. We decided the magneto was all right. The engine ran no better. "Get a new sparking-plug," said Jim. We got a new sparking-plug. 7s. 6d. No difference.

Jim was still not satisfied with the mag. He hadn't had the shock. "What colour is the spark?" he asked. We examined some assorted sparks. "Red," we reported. "Well, what do you expect? Of course it won't run properly. It should be blue," said Jim.

We felt small and apologised for our ignorance. "How does one set about altering the colour

of a spark?" we asked. "Probably the condenser in the mag. breaking down," announced Jim. "I'll see if I can get hold of another mag. You can try that, and if the engine runs all right, that's what it is."

He got hold of another mag. It was a different make from our own, and we spent one evening clamping it in position and timing it up, and another evening trying to start the engine. We reported to Jim that we thought that our mag. was all right, but that there was something wrong with his. He began to get abusive. "Must be something wrong with the carburettor after all," he said.



We began to think this was where we had come in.

All this had been spread over a period of about a couple of months, and the eight-stroking had become steadily worse and worse. It was happening now when we were running along on the level, and sometimes even when we were going uphill. Something had to be done about it. We had tried everything we could think of to reduce richness of mixture and increase strength of spark. We began to look around for something else to muck about with. The only thing left was the inlet valve, short of changing the air in the tyres or putting the pillion-seat on the other way round. It should be pointed out that compression had been excellent all the time.

We examined the inlet valve. A little bit sloppy in the guide, but not seriously, we thought. However, now that the valve was out it wouldn't take long or do any harm to temporarily doctor it up to eliminate any air leak that might be there. The sketch, Fig. 1, shows how it was done. Just a Hallite washer to fit over the valve stem, with a light spring to keep it up against the bottom of the valve guide, and plenty of grease slopped around it to seal it up as far as possible. The whole caboodle was then put together again and started up.

Eureka! Almost perfect running! ("Almost," because, after all, it was only a bodge.) We took the bike for a run round. Beautiful. Bike purred like a pussy. So did rider. No eight-stroking, quieter, and more power.

The washer wore out after about 40 miles, but had shown up the cause of the trouble. Now we knew it was a simple mechanical matter we could go ahead and cure it.

We couldn't get a new valve and guide, so we decided to doctor the old valve, and make a new guide to fit it. Fig. 2 shows the state of the valve "before." It will be noticed that there was a portion of unworn stem which had poked down below the guide. A bit of square brass bar was clamped in the tool-post of the lathe, and drilled and reamed from the headstock. Luckily, the valve had a centre in the head, and with this on the headstock centre and the unworn end of the stem running in the hole in the "steady," a small centre was put in the tail-end by means of the tailstock. The valve was then run between the two centres and the stem turned down until it was parallel. (The wear amounted to about 0.006 in. on diameter.)

The new guide was made from a piece of phosphor-bronze, and a special little boring-bar made up to get right through the hole. We bored it about 0.001 in. larger than the valve-stem, to allow for expansion.

The puzzling thing is, why did this air-leak give such definite rich-mixture symptoms, and none of the recognised symptoms of weak mixture? I don't know. Jim doesn't know. If you are an expert, perhaps you can tell us. If you're not, maybe this will help you if you ever get similar trouble.

One last word. Thank-you, Jim, for your assistance. We have been pulling your leg a bit, but you were very helpful and patient, and you certainly taught us a lot about motor-bikes, and you helped us to find out what the trouble was by eliminating all the things that it wasn't.

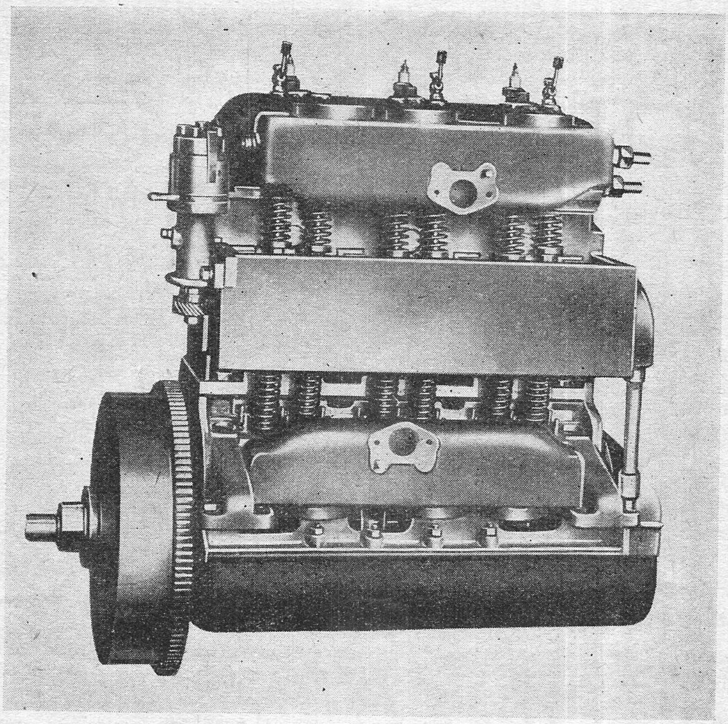
For the Bookshelf

The Early History of the Motor Car, 1769-1897, by R. W. Kidner (The Oakwood Press, 30, White Horse Hill, Chislehurst, Kent.) Price 6s. od.

A most interesting book on a not-too-well-known subject; it sets out to trace the development of the mechanical road vehicle during the period quoted above. It is profusely illustrated with black-and-white sketches of early road vehicles, which must have entailed a considerable amount of research and we feel sure will be of great interest to our readers. Outside of museums, very little has been published on this fascinating history, and we congratulate the publishers on bringing out this reasonably-priced little volume. We understand that a second one, covering the period 1898 to 1946 is due to be published in the near future.

George Goodman Discourses on

Double-Acting Petrol Engines



A 3-cylinder 4-stroke double-acting engine

WHEN re-perusing some of your interesting series entitled "Improving the Two-stroke," and more particularly Mr. Westbury's contributions, it occurred to me that your readers might be interested in the following notes on engines constructed with my collaboration.

Three four-stroke petrol engines were built in 1927 and 1928, the first having one cylinder and the second and third three cylinders, that is to say, each engine having three cylinders had six combustion spaces which were identical in every respect. The second engine, of 45 h.p., is illustrated by the photograph reproduced.

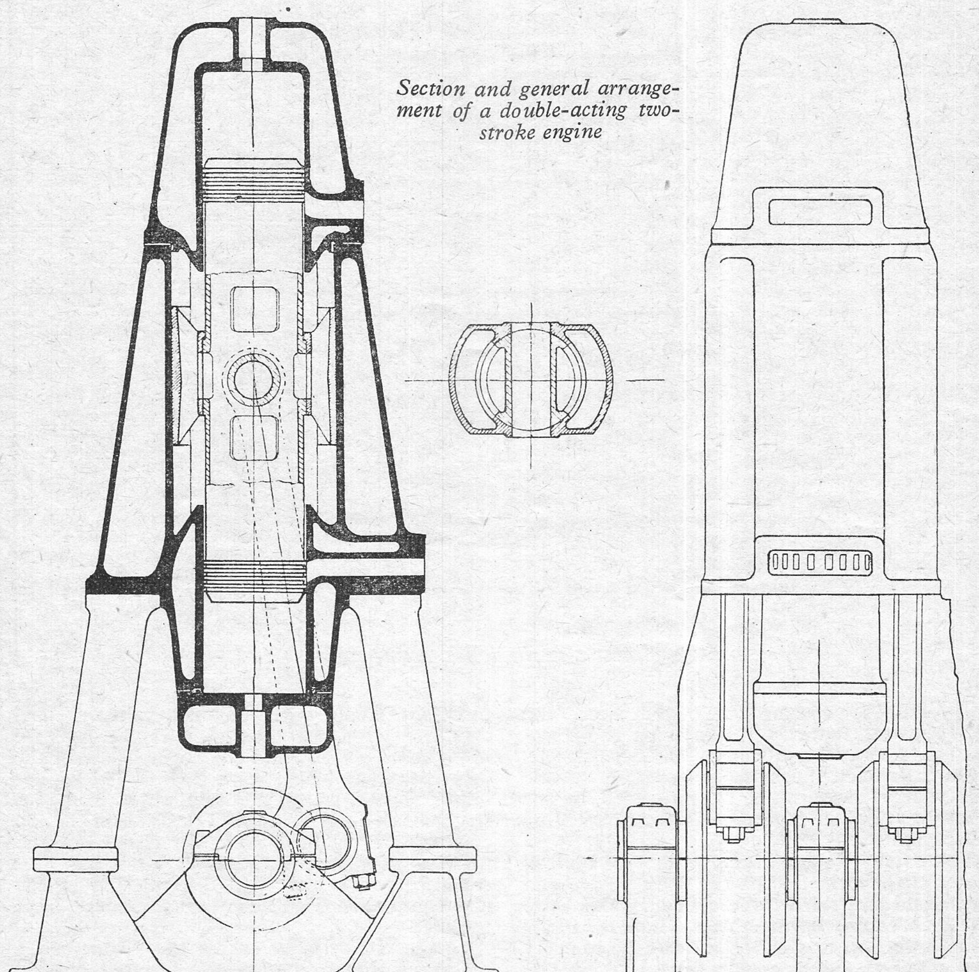
The design was evolved with the object of producing a double-acting engine which had no stuffing boxes, no side thrust on the ring-carrying portion of the pistons, piston ventilation and cooling by air, a separate clean and cool crankcase, independent lubrication of the pistons, good accessibility and other minor attributes which the engine-minded will no doubt discover when considering it. Accordingly, a double-ended piston worked in a double-ended cylinder with conventional side-valve heads. The valves were housed in cages and actuated by a common single camshaft. The third engine had modern turbulent heads with inclined valves. The cylinders were cast integral, with the inverted heads at the bottom, and the upper halves of the main bearings, which were thus cooled by the inflowing cool water, and the whole formed a structure of great rigidity. The heads at the top ends of the cylinders were detachable for the purpose of piston withdrawal, after the dual connecting-rods had been disconnected at the gudgeon pin ends and the latter removed from outside.

In the one-cylinder engine the piston had a crosshead slipper to take the reduced oblique thrust of the long dual connecting-rods, but in the last two engines the middle portion of the piston trunk took the form of a slipper and bore on the relatively cool and copiously lubricated part of the piston-walls, leaving the crowns to act as ring carriers only. The gudgeon pins passed through the centres of the pistons and protruded on both sides through large slots in the cylinders, the connecting-rod small-ends being fixed to their ends, of course. They were lubricated by oil mist only, whereas all crankshaft bearings were lubricated and cooled by splash. The crankshaft had five bearings and disc webs, and proved well nigh everlasting. The

wide slots for the gudgeon pins and the cut-away portions of the pistons allowed free air circulation, and the exposed parts of them could be touched with bare fingers at all times. The front and rear ends of the central engine housing were open to atmosphere.

As the layout of these engines did not venture into the realms of the unknown and incalculable, no trouble of any kind was encountered, except with lack of uniform mixture distribution in the inlet manifold, which was soon overcome by trial and error, resulting in the use of one carburetter. When last heard of after 11 years of uninterrupted service in a small engineering works, the two three-cylinder engines had required nothing but new or oversize rings and the taking-up of the small end bearings of the engine fitted with fixed gudgeons, whereas the floating gudgeon pins with fixed small ends showed no appreciable wear owing to the larger bearing area.

As already stated, the first 3-cylinder engine developed 45 h.p. at 1,800, and the second 20 h.p. at 2,300 r.p.m. Compared with single-acting conventional in-line engines of equivalent output, the new double-acting type was 40 per cent. lighter and smaller, and of the same approximate height as an orthodox o.h.v. model, as may be gauged from the photograph. Fuel consumption was 5 per cent. better, which in the absence of any other explanation was placed to the credit of an estimated improvement in mechanical efficiency of from 10 to 12 per cent., mainly due to the double-acting principle and the reduction in piston friction, which is the heaviest item under that heading in any engine.



Section and general arrangement of a double-acting two-stroke engine

The only objection ever brought forward against this new type of engine consisted in the increased reciprocating weight and forces of inertia for ultra-high-speed running, which in a

(*Continued on page* 358)

In Praise of Steam

By G. W. EVES

SOME time ago in these pages Mr. Don asked that someone should keep the ball rolling on the subject of traction engines. To me this will be easy, for I come of a family who lived literally amongst them. My old Dad started work at a tender age as driver's mate on one of the first engines that invaded the tranquility of my distant Kentish village. What stories he could relate of those early days. This engine had the motion work in the tender behind the driver, and the most important item of this threshing outfit was the man who preceded it with a red flag. The wagoners heaped curses on the puffing monster which made their charges snort and rear. Then came another. This engine had five wheels, the odd one stuck out in front of the usual four, it being the steering-wheel, and was operated by the steersman, who sat in front of the smokebox, with a handle like a bath-chair. The two front wheels were jacked up clear of the road, when it was on the road. Later on came the Fowlers. These were (in my parent's mind) in the steam-users' sphere what Rolls-Royce is in the car industry.

I have heard much about the singles, 8 h.p., which had a dome over the spring-balance on the cylinder top, a very distinctive item, wherein the driver could bake the best in potatoes. These engines were used mostly for ploughing, pulling six furrows with ease. But these were before my time, but I have many of my own recollections. For with a steam contractor in the next village, my boyhood days were a sheer delight.

There were ploughing sets, threshing sets, steam rollers, road haulage sets, and Foden wagons, in endless variety. When bitter winds have swept the stackyards, and the best place for small boys was indoors by the fire, I was with old Jack, the threshing-machine driver. He always answered my many questions with a gentle smile, and at a tender age he used to let me " put a lump or two on the fire " (his single Aveling was very economical), stop it at meal times, and the water I would watch with an eagle eye. He would turn a keen ear toward the engine, then say to me : " Got the pump on then, Jim," for you see, the ball in the check valve made a pleasant burring sound. There was another threshing-engine from the same stable, a Wallace, which had a most peculiar valve-gear, for inasmuch it had only one cylinder, it had three link motions, all in a bunch.

Steam-rollers were often in the neighbourhood, rolling-in flints. These, too, were mostly single Avelings, and I never see a rampant horse without coupling it with these engines. These always had the driver's house on wheels not far away, for often they were working far from any habitation. All the road haulage then was done by steam traction with three big trucks behind. Bricks, sand, tiles, and stones were their loads, loads which would have taxed the powers of modern transport. In the centre of my village was a river, and these engines always stopped here to fill up the tank with the steam water lifter. Drivers of these were reputed to be the possessors of unslakable thirst, hence the " Plough Inn," nearby was their destination once the strainer of the hose-pipe had been placed in the river, resting in the shovel to keep out the sand.

The local brewery delivered all its barrels with Fodens and Yorkshires ; the latter had the boilers across the front of the engine. Dad remembered the first Foden they had, which came through the village with a load of the employees in top hats and bowlers. All these were on steel-rimmed wheels, and on frosty days they would slide all over the road, with willing hands throwing ashes and sacks under the slipping wheels. But the ploughing tackle was my favourite.

When my school chums were bowling hoops and flying kites, I would be riding on the six-furrow plough, watching the smooth furrows of brown earth being turned over so effortlessly. I watched the under-ploughman, and learned how to change a broken " point " on the plough body and to give the coulter a whack with a hammer when a stone got wedged in it. Often the engines would be out of sight over the brow of the hill, and this entailed sundry whistle-blasts, for the drivers, and for us on the plough, many signals which had semaphore signals a long way behind.

As for the engines, the first ones I recall were the single-crank compounds Mr. Don spoke well of. But the drivers did not share my worthy friend's views. They were devils to stop on dead centre, and no amount of coaxing would shift them which was maddening, particularly when the other driver wanted to start the return pull. The last resource was to put a crowbar behind the ploughing clutch and lever it out. But the unprintables which filled the air. . .

There were, a little later on, the big compound Fowlers, my Dad's pride and joy, although he was past driving them. They moved about with the ease of a car, and pulled six furrows just as easily. The provision of " live steam in the low " made ploughing work very simple, so much that several of the drivers I got to know let me drive. They used to stand behind me, when the plough got close to the engine, but I soon got to know my charge, and at the precise moment would reverse it, and the plough gear would drop out on its own accord.

One strange job one of these engines did was to pull up a long steep hillside all the requirements for a big house. The traction and three trucks would stop at the bottom of the hill, and once the long steel cable was hitched to the front coupling of the engine, the whole train would be dragged up the slope.

Lastly, I must mention the portables, which were familiar to me. The local hop-driers always used them to drive the fans which circulated the hot air through the hops. That was my old Dad's last job, driving one of these in a rural setting.

Alas ! All those joys are now gone, and the familiar ring of steel pinions which ever echoed over my village home, are lost for all time. I pleasantly envied your writer who bought himself

(*Continued on page 362*)

*Electric Locomotives for Passenger-Hauling—(2)

by "Milli-Amp"

THE diversity of types of electric locomotives is not as great as of their steam sisters, though it is sufficiently so to cause some indecision in choosing a suitable prototype for a model—especially if one looks overseas! I therefore decided to limit the range in this case, and look among the British examples for something that would fill the bill. This may be rather disappointing to any readers who had visions of building, say, a gigantic Swiss locomotive with about two dozen wheels and smothered in "blobs and gadgets."

Generally speaking, the British examples are cleaner in appearance and have much simpler wheel arrangements—great advantages from the model point of view. Nasty little problems in springing can arise in electric and diesel traction—and this also applies to transmission. These matters are capable of being easily solved in the prototype chosen (Fig. 3), as there is plenty of room for the motors to be mounted on platforms which in turn are what might be called "axle hung, in reverse."

tives weigh some 56 tons and are designed for hauling trains of about 180 tons at a maximum speed of 65 m.p.h.

Fig. 2 shows one of the several L.N.E.R. electric locomotives of different types, this one having a 4-6-4 wheel arrangement—unusual in British electric traction.

L.N.E.R. No. 6701, shown in Fig. 3, is more modern than the two previous examples. Built in 1941, it has been in service on the Manchester-Altrincham section of the L.N.E.R., though eventually destined for the Manchester-Sheffield section when the electrification is completed. The bogies carry two motors, one to each axle, of 460 h.p. each, total h.p. thus being 1,840. Designed for mixed traffic work, freight trains of 450-850 tons, and passenger trains up to 350 tons, can be dealt with up to a maximum speed of 65 m.p.h.

In passing, I may mention that I hope to be able to include dimensioned outline drawings of the engines shown in Figs. 1 and 2, together with the new Southern Railway CC 1 electric locomotives, later on in this series of articles.

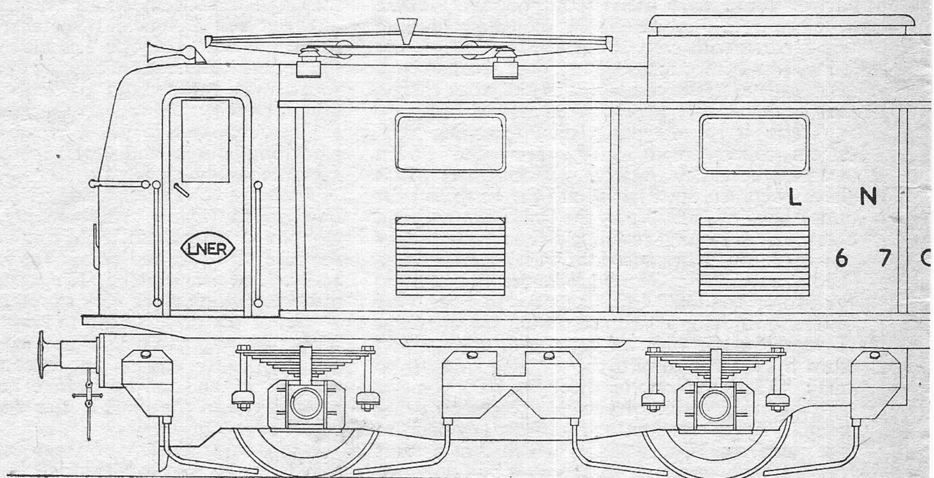


Fig. 4. Side elevation of the m

Before considering our prototype in greater detail, a few facts and figures relating to the locomotives shown in Figs. 1 and 2 may be of interest. The first of these is one of a class built between 1919 and 1922 for the Metropolitan Railway (now controlled by the London Passenger Transport Board), 20 being placed in service in all. The wheel arrangement consists of two four-wheel bogies, each axle carrying a 300 h.p. motor, giving a total of 1,200 h.p. The locomo-

There are also a number of electric shunting locomotives employed in works and sidings all over the country, and any reader having details and/or photographs of any of these would be doing a service to those interested in this subject by passing the information on through the columns of THE MODEL ENGINEER.

Reverting to the model. Fig. 4 shows the side elevation, and Fig. 5 the end view, and together will give a pretty good idea of the proportions and pleasing appearance of our "Miss Milly Amp." Hardly any simplification of external details of the big sister has been necessary, which

**Continued from page 288, "M.E.," September 19, 1946.*

should please Inspector Meticulous! Internally, of course, things are very different.

In place of the mass of complicated electrical and pneumatic equipment (and including an electrically heated steam boiler for train heating!) all we shall need is a bank of resistances and a certain amount of wiring. Unlike the big sister, whose motors are entirely below "floor-level," our motors must project up through the floor to a certain extent, due to the fact that they are over scale size. It would be possible to use four small motors as in the prototype, but much higher efficiency is attained by using only two motors of larger size.

The control of the model will be through an orthodox controller and reversing handle, working on exactly the same principles as the full-size controller, but instead of electric or electro-pneumatic relays being interposed between the controller, resistances and motors, it will operate direct. For anyone sufficiently keen on electrical and watchmaking work, there is nothing to prevent him fitting relays, though they are not necessary for the successful operation of a model. For our purpose, however, I have decided that "simplicity with efficiency" shall be our motto, and shall leave over complications of this kind until later.

Opinions will probably vary as to the best place for the controller to be installed, but as it is completely self-contained (except for electrical connections) no serious difficulties arise. There is much to be said for having it on the passenger truck and using "jumper" cables to connect up to the locomotive. In this position, it would be very convenient to handle and the truck could be coupled to either end of the locomotive. Or, alternatively, the controller can be fixed under the roof of the model and operated by means of a removable handle inserted through the end of the cab structure.

There is much to be said in favour of both these methods, and as it is only a matter of connecting up, you can take your choice. Personally, I shall use the first method.

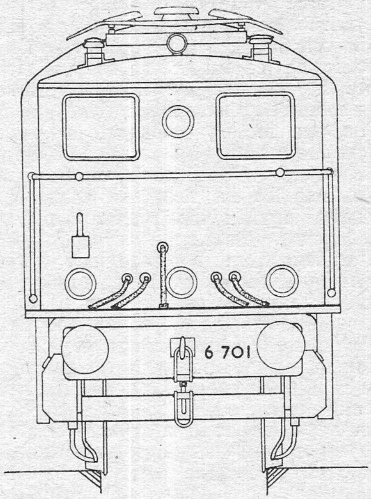
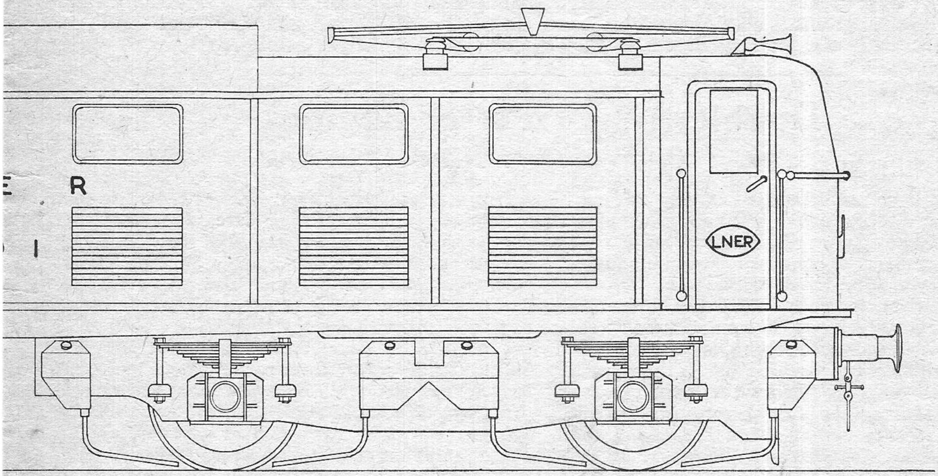


Fig. 5. End elevation

In the prototype, the current is collected from overhead cable by means of the pantagraph at either end of the locomotive. Obviously we cannot use the overhead system on a passenger carrying model, so the pantagraphs shown in the drawings are dummies, and current will be collected by a shoe from a third rail. This can be a specially provided centre rail, or use can be made of an existing rail in the case of multi-gauge tracks, provided the chosen rail is properly bonded at the joints. The collector shoe will be adjustable transversely across the locomotive for this purpose. The return side of the circuit is completed through the running rails, one of which, at least, must also be bonded at the joints. Full track details will be given later in these columns, so there is no cause for worry in that direction!



...el L.N.E.R. No. 6701 locomotive

The same applies to resistance values, motor, and transformer windings and everything else—all the calculating will be done, the actual construction carried out and all sorts of tests made before the details appear in print, so that everything should be plain sailing.

The two motors employed on the model, designed to operate off a 30 volt D.C. supply, are series wound. The use is made of standard laminations for the field and armature, which not only simplifies construction but also makes for efficiency. Plain spur gearing is used in the transmission from motor to axle, three point suspension of the motors being employed, which enables the motor and gearing to follow any "ups and downs" of the axles without involving any elaborate transmission system.

Control of the motors is on exactly similar lines to full-size practice. Before the locomotive can move under power, the reversing lever must be moved to either forward or reverse positions. This, apart from changing over connections and thus determining the direction in which the locomotive will travel, opens an interlock and enables the controller handle to be moved to its first position. In this position, both motors are connected in series with each other and on moving the handle to the next notch, current flows to the motors *via* the resistances and the locomotive moves off. Further movement of the controller cuts out the resistances in steps, thus allowing the speed to increase up to the maximum possible with the motors still in series. (All this will be gone into in greater detail later, with the aid of diagrams; all that need be said now is that with the motors in series they operate at half the line voltage, i.e. 15 volts, with all resistances out of circuit.)

The next successive steps on the controller cut off the current, change over the motors from series to parallel connection, again insert all the resistances in circuit and then step by step cuts them out again, until the motors are working on full line voltage and at maximum speed.

All this sounds quite complicated, but in reality is quite simple, as will be seen later when we consider the control equipment in detail. The idea underlying all this series, parallel and resistance business is to give the driver a very flexible means of control over the locomotive. If the current is switched on at full voltage to *any* electric motor, under load especially, very heavy currents flow for a short period while the motor tries to "get moving." If the fuses in circuit were designed to afford protection to the motor when normally running, they would blow under this excess starting current, and if heavier fuses were to be inserted, then they would obviously afford little protection at any other time.

In the case of an electric locomotive having the current turned full on direct, the result would be (if the fuses and circuit-breakers stood up to it) violent wheel-slip, with very little movement of the train—exactly the same as in steam.

In the article to follow, general assembly and detail drawings of the bogies will be given, together with the constructional details. It is also hoped to include some photographs of the bogies under construction. The overall length of the model in $3\frac{1}{2}$-in. gauge comes out at 3 ft. 2 in., and the width at $6\frac{3}{4}$ in., the bogie wheelbase being $8\frac{5}{8}$ in.

(*To be continued*)

Double-Acting Petrol Engines

(*Continued from page* 354)

two-stroke, however, would be largely offset by compression and combustion taking place every time the double-piston reaches dead centre. If, on the other hand, a conventional double-acting crosshead type, like R.W. or M.A.N., be compared, the advantage is overwhelmingly with the new design under review. The chief engineer of a famous concern, whose name is a household word in engineering, worked out a comparison between two engines having the same number of combustion spaces and pistons of identical bore and stroke, but allowing for the higher speed possible with the new design, thanks to reduced reciprocating weight and the cooling of the pistons by air instead of oil, and pointed out that these figures compare favourably even with the opposed-piston system. A conventional engine of 1,800 b.h.p. at 120 r.p.m. has reciprocating parts, i.e. piston, piston-rod, connecting-rod and crosshead, weighing approximately 2,000 kg., whereas the weight of the equivalent parts of the new engine, i.e. the double-piston with its slippers and dual connecting-rods, is in all about 850 kg., representing a saving of no less than 1,150 kg. with an engine which would develop 4,500 b.h.p. at 350 r.p.m. Gains of this magnitude would have materially contributed in our battle for shipping supremacy.

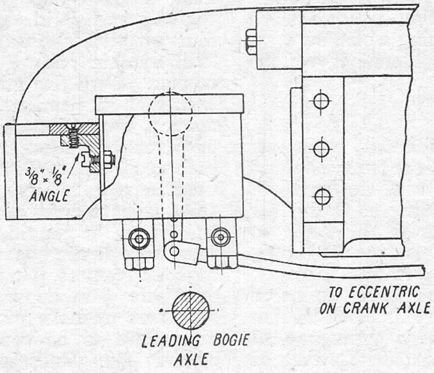
An interesting historical item to record is that at the beginning of the late war a certain competition for the best design of high-efficiency engine running at about 2,300 r.p.m. normally, with the best power/weight ratio, was arranged. A double-acting two-stroke on the lines reviewed in this article was an easy winner, but such were the prejudice against two-strokes and the disinclination to depart from conventional standards at that time that nothing was done. The engine proposed, although longer than the now popular V-type, was still lighter than the latter, and considerably quicker and cheaper to manufacture. A general arrangement and part sectional view of a two-stroke example is shown on page 354.

The general arrangement of a two-stroke shown exemplifies a marine or stationary type of oil engine. In the opinion of the designer, this is even to-day unsurpassed for simplicity, robustness, low initial cost and good general running conditions in the heavier slow- and medium-speed classes. It might be worth while to utilise the piston-slipper as a pump-plunger for scavenge air, and the surrounding space in the engine housing as a receiver. Once the engine has started, the charge could be boosted by an exhaust-turbo-blower.

"L.B.S.C."

MECHANICAL LUBRICATOR for "HIELAN' LASSIE"

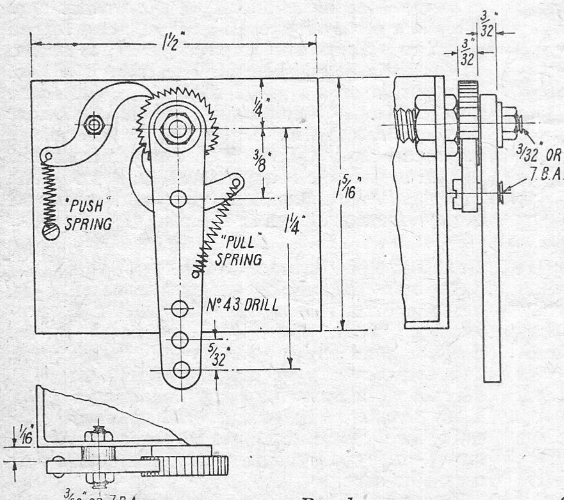
THE lubricator described below differs from anything hitherto specified in these notes by virtue of being what our motoring friends would call a V-twin, having two pumps of different bores. As the inside and outside cylinders of the "Lassie" are supplied by separate connections to the hot header of the superheater, and there is no central steam distribution point outside the smokebox into which a common oil supply could be fed, it will also be necessary to split up the oil feeds. The uninitiated will probably wonder why oil could not be supplied by a single pump to a three-legged spider fitting, thence by separate pipes to each cylinder; but although this sounds feasible and would work up to a point, it suffers from a serious drawback. The oil delivered to the spider fitting would naturally be at a constant pressure during the delivery stroke; but as it would naturally take the path of least resistance when leaving the spider, all three pipes would have to be exactly the same length and internal diameter, and if clacks were provided at the entry to the cylinders, the springs would all have to be exactly the same tension. Otherwise, the cylinder with a short pipe or a weak clack spring would get an extra supply of oil at the expense of the other two. As I have found from practical experience that a pump, delivering into a plain tee with pipes of equal length to two outside cylinders, will feed satisfactorily, one pump in the twin will feed the outside cylinders only, and the other one will feed the inside cylinder direct. Naturally the inside merchant won't need as much oil as its two confrères outside; and so the pump feeding it can be made smaller in the bore. The two pumps work off one crank; and as the smaller ram or plunger needs a separate big-end bush to work on the crankpin, the two pumps have to be set at different centres to allow the two rams to clear. I guess that will explain the "whys and wherefores" to novices and beginners, so now let us get on with the job of making the contraption. It is easier than it looks!



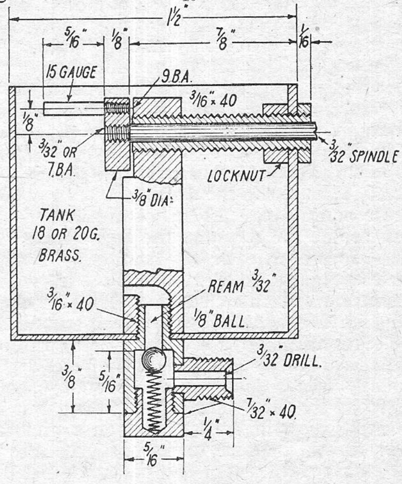
How lubricator is erected and driven

Oil Tank

The simplest way of making the oil tank, is to cut a strip of 18- or 20-gauge sheet brass 6 in. long and $1\frac{5}{16}$ in. wide, and bend it into a rectangle with $1\frac{1}{2}$-in. sides. Stand this on a piece of the same material a little over $1\frac{1}{2}$ in. square, in your brazing pan; then silver-solder all around the bottom, and down the open corner. Pickle and wash off, then file the bottom flush with the sides, and trim off the corner which is joined, if it needs it. Scribe a line right across the centre of the bottom plate; make a centre-pop $\frac{3}{8}$ in. from one side and $\frac{1}{4}$ in. from the other; drill them $\frac{3}{16}$ in. clearing. Drill another $\frac{3}{16}$-in. hole, $\frac{1}{4}$ in. from



Ratchet gear

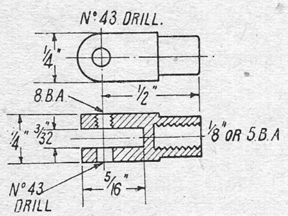


Section through bearing and check valve

the top of the side that is to your right hand, when the tank is right way up, and the holes in the bottom plate nearest to you. A snap-on lid can be made for the tank, either by flanging a bit of 18- or 20-gauge brass sheet over an iron former $1\frac{1}{2}$ in. square; or by cutting out a piece of brass $1\frac{7}{8}$ in. square, taking a nick $\frac{3}{16}$ in. square out of each corner, and bending $\frac{3}{16}$ in. of each side at right angles, thus forming a shallow tray. The corners can be silver-soldered if you so desire.

Pump Stand

Castings may be available for this, or it may easily be cut from the solid; if the latter, saw and file to the shape shown, from a $1\frac{1}{4}$-in. length of $1\frac{1}{4}$-in. by $\frac{5}{16}$-in. brass bar, same as I did for "Jeanie Deans." Machining is the same in either case. Beginners please note: All holes, except the oil inlets, should be drilled either on a drilling machine, or in the lathe against a drilling pad on the tailstock; it is essential that the holes for bearings should go through dead square. At $\frac{3}{16}$ in. from the apex, drill No. 22 or 5/32-in., and tap $\frac{3}{16}$-in. by 40 for spindle bearing. Locating from this, mark off the trunnion holes



Driving fork

and ports to sizes given on the illustration; drill trunnion holes No. 41, and ports No. 53, these only going halfway through the stand. Now note carefully: close to the left-hand edge of each foot or base, and about on the middle line, make a centre-pop, and from it drill a No. 53 hole into the left-hand port, as shown in dotted lines. Then, with a rat-tail file, make a "mouse-hole" in the wall, so that oil can get into the duct when the stand is in place at the bottom of the tank. At $\frac{1}{8}$ in. from the right-hand side of each foot, about on the centre line, drill a 5/32-in. hole $\frac{3}{16}$-in. deep, and tap it 5/32-in. by 40; from the top of this, run a 3/32-in. drill into the right-hand port. That settles the drilling.

File or mill away $\frac{1}{16}$ in. of the face, from the apex to the point where the legs divide; then ditto repeato on each leg, from a point 3/32 in. above the ports, to form a recess $\frac{1}{4}$ in. wide, see illustration. Form a circular recess, $\frac{1}{4}$ in. diameter and $\frac{1}{8}$ in. deep, at the back of each trunnion hole (see section) the boy for this job being a pin-drill. The raised portions left after the recessing must be truly faced, and this job is done exactly as described for the cylinder port faces; but if you are using a casting, rub it first on a smooth file. After facing, be sure to wash all the chippings and emery dust out of the ports and oil ducts; recollect you are making a lubricator, not a valve and piston grinder!

Pump Cylinders

These are kiddy's practice jobs. The bigger one needs a bit of $\frac{1}{2}$-in. by $\frac{5}{16}$-in. brass rod, and the smaller $\frac{3}{8}$-in. by $\frac{5}{16}$-in. ditto, both $\frac{9}{16}$ in. long after both ends have been squared off in the lathe. On the centre-line of the narrow end, make a centre-pop $\frac{5}{16}$ in. from the edge of the big one, and $\frac{3}{16}$ in. on the little one; chuck in four-jaw with the pop mark running truly, and drill the big one No. 33, following with $\frac{1}{8}$-in. reamer. Drill the small one No. 44, and finish with 3/32-in. reamer. If you haven't any regular reamers these sizes, simply get a couple of bits of silver-steel about 2 in. long, file one end of each to a long oval, like the delicatessen merchant used to slice a Jerry breakfast sausage, harden and temper to dark yellow, rub the oval faces flat on an oilstone to get rid of the file marks and any roughness of the edges, and lo and behold! you have the reamers. Open out the ends of the bores to a bare $\frac{3}{16}$ in. depth with $\frac{3}{16}$-in. drill—it pays beginners to make pin-drills for jobs where two holes have to be concentric—and tap 7/32-in. by 40. The glands are made the same as those on the engine cylinders, so we needn't go over the rigmarole again. Use 7/32-in. brass rod, and make them about $\frac{1}{8}$ in. long; cross-nick with a saw or file.

Scribe a line down the middle of each port face, centre-pop it 3/32-in. from the end opposite gland, and also at $\frac{1}{4}$ in. above that. Drill the bottom hole No. 53, piercing the bore. Drill the other one No. 48 and *don't* pierce the bore; tap it 3/32-in. or 7-B.A. Poke the reamers through again, to clean out any burrs, and then turn up two little plugs for the cylinder ends as shown, from $\frac{1}{4}$-in. rod. These should be a tight drive fit in the bores; solder over the heads for the sake of "safety first." True up the port faces same as you did the engine slide valves, and screw in the trunnions; these are $\frac{11}{16}$-in. lengths of 3/32-in. round rod, screwed both ends, as shown in the illustrations.

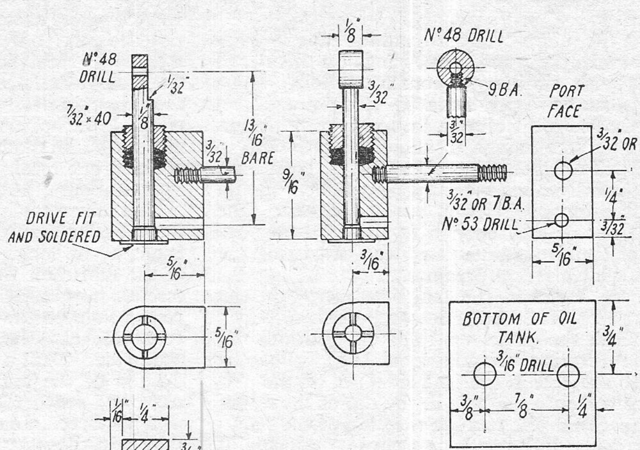
The larger ram is a piece of $\frac{1}{8}$-in. round silver-steel, or rustless steel, $\frac{7}{8}$ in. long, with a No. 48 cross hole drilled at one end, and a flat filed on it to clear the big-end bush of the smaller ram. This is a piece of 3/32-in. steel, one end turned down to 5/64 in. and screwed 9-B.A. as shown in the little detail sketch. The bush is a $\frac{1}{8}$-in. slice parted off a 7/32-in. rod held in three-jaw. Drill a No. 48 hole through the middle before parting off, and then drill a No. 53 hole in the edge, and tap it 9-B.A. The distance from end of ram to the hole is approximately $\frac{13}{16}$ in. Pack the glands with graphited yarn, and round off the cylinders as shown in the plan view.

Bearing, Spindle and Crank

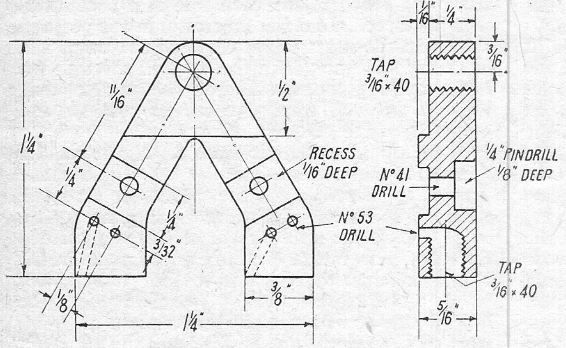
To make the bearing, chuck a piece of $\frac{5}{16}$-in. hexagon brass rod in three-jaw with 1 in. projecting. Turn down $\frac{7}{8}$-in. length to $\frac{3}{16}$ in. diameter, and screw $\frac{3}{16}$-in. by 40. Face, centre, and drill down 1 in. depth with No. 41 drill. Part off $\frac{15}{16}$ in. from the end, this leaving a $\frac{1}{16}$-in. head. Make a nut to suit, from the same size rod; face, centre, drill 5/32 in. for $\frac{3}{16}$ in. depth, tap $\frac{3}{16}$-in. by 40, chamfer the corners, and part off a $\frac{1}{8}$-in. slice.

The spindle is a piece of 3/32-in. silver-steel,

approximately $1\frac{7}{16}$ in. long, with $\frac{1}{8}$ in. of 3/32-in. or 7-B.A. thread on each end, and carries a ratchet wheel $\frac{7}{16}$ in. diameter, 3/32 in. wide, with about 35 to 40 teeth. If you haven't the appliances to cut a wheel, and cannot get one from your local clockmaker, send me a self-addressed stamped postcard and I will tell you of a sure and quick source of supply. The wheel should be drilled No. 43 and forced on to the spindle, so that $1\frac{1}{16}$ in. projects from the bearing side. Tip for beginners: press an overlength



Details of pumps



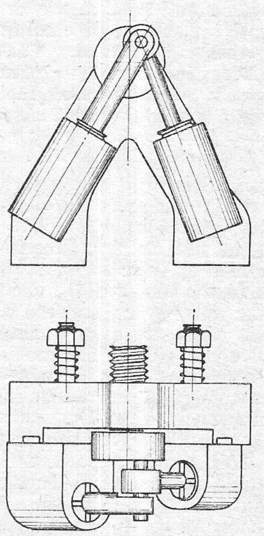
Stand for twin pumps

bit of silver-steel through the wheel first, then cut to length and screw the ends afterwards; this saves a lot of trouble, as you don't have to shift the wheel any more, when once it is on. *And* be careful it is on the right way; with the long end of the spindle away from you, the vertical side of the teeth should point left, the sloping side right; the lubricator works clockwise, looking at the ratchet end.

The crank is only a few minutes' work. Chuck a bit of $\frac{3}{8}$-in. round rod in three-jaw; face, centre, drill $\frac{3}{16}$ in. deep with No. 48 drill, and tap to match the spindle. Part off a $\frac{1}{8}$-in. slice. At $\frac{1}{8}$ in. from centre, drill and tap a 9-B.A. hole (53 drill) and screw in a piece of 15-gauge spoke wire, so that $\frac{5}{16}$ in. projects from the crank disc.

Check Valves or Clacks

Chuck a bit of $\frac{5}{16}$-in. round rod in three-jaw; face the end, and turn down $\frac{3}{16}$ in. length to $\frac{3}{16}$ in. diameter; screw $\frac{3}{16}$ in. by 40, and part off $\frac{3}{8}$ in. from shoulder. Reverse in chuck, centre, drill right through No. 44, open out with $\frac{3}{16}$-in. drill and bottom with $\frac{3}{16}$-in. D-bit to $\frac{5}{16}$ in depth. Tap the end of the hole 7/32 in. by 40, taking care not to let the tap run into the seating and spoil it. Countersink the end slightly, then run a 3/32-in. reamer through the remnants of the 44 hole. Drill a 5/32-in. hole in the side, half-way along the body. Chuck a bit of $\frac{1}{4}$-in. rod in three-jaw, turn down about $\frac{3}{8}$ in. to 7/32 in. diameter, and screw $\frac{1}{4}$ in. of it 7/32 in. by 40. Face the end, centre deeply, drill down $\frac{3}{8}$ in. depth with 3/32-in. drill, and part off $\frac{5}{16}$ in. from the end. Reverse in chuck, turn the blank end to fit the hole in the clack body, squeeze it in, and silver-solder it. Pickle, wash, and clean up; then seat a $\frac{1}{8}$-in. ball on the 3/32-in. hole, same as you did the engine pump-valves. Make a little cap from $\frac{5}{16}$-in. hexagon brass rod, to fit the clack body; but before parting off, centre and drill it a bare $\frac{1}{4}$ in. deep with No. 30 drill. Wind up a little spring from steel wire about 26-gauge, around a bit of 15-gauge cycle-spoke, or something


How pumps should look when assembled

about the same diameter; when this is released, it will spring out to a nice sliding fit in the No. 30 hole. Square off the end that presses on the ball, by holding it for a second or two against the side of a fast-running emery wheel; then cut to such a length that it just starts to compress as the cap is screwed home.

Assembly

Poke the pump-cylinder trunnion pins through the holes in the stand, put springs on them, and secure with ordinary commercial nuts. The springs can be wound from 22- or 23-gauge steel wire, around a bit of 3/32-in. rod; compression should be just enough to allow the cylinders to be pushed off their faces about $\frac{1}{16}$ in. before the spring is fully compressed. The cylinders should have freedom to oscillate, but at the same time should not be easy enough to allow oil pressure to force them off the faces instead of passing the clacks against steam pressure.

Put the stand in the tank, and screw in the clacks through the holes in the bottom of tank; these hold the stand vertically in position, the bearing forming an additional stay. Poke it through the hole in the tank side, put on the nut, and screw it into the hole in the top of the stand, until the head just touches the side of the tank; then run the lock-nut back against the inside of tank, and tighten it, as shown in side view of the ratchet-gear. Put the crankpin through the holes in the rams, and hold it with the centre hole in line with the centre of the bearing; then put the spindle through the bearing, and screw it home into the crank. The spindle, when right home, should have just the weeniest bit of end-play. The lubricator can now be tested by putting some oil—automobile engine-oil will do—in the tank, and turning the ratchet-wheel clockwise with your fingers. A distinct resistance should be felt as the rams take the downward stroke and the oil forces the clack-balls off their seatings. Put your thumb over each outlet in turn; and if the lubricator is O.K., no matter if you are as strong as Samson and have a grip of iron, you won't be able to prevent the oil coming out when the ratchet-wheel is turned. These weeny lubricators have been tested to pump against 450 lb. pressure; and that wasn't the limit, the tester was afraid of straining his master gauge!

Ratchet Gear and Erection

All that remains is to fit a waggler to operate the ratchet wheel, and erect the doings on the engine. The ratchet-lever is filed up from 3/32-in. by $\frac{5}{16}$-in. steel strip, to dimensions given; the pawls are filed up from the same stuff, to the shape shown in the illustrations, which are full size. Drill the tails $\frac{1}{16}$ in., and the pivot holes No. 41. Both pawls are case-hardened as described for valve-gear parts. The moving pawl is pivoted on a screw turned up from $\frac{3}{16}$-in. silver-steel, with enough plain left under the head to allow free movement when the screw is right home; I told you how to do that in the valve-gear notes. The stationary pawl works on one end of a double-ended stud. Chuck a bit of $\frac{3}{16}$-in. steel rod, and turn down one end of it to 3/32 in. diameter for $\frac{3}{16}$ in. length, putting 3/32 in. of thread on the end. Part off at $\frac{1}{4}$ in. from the shoulder; reverse in chuck, and repeat operation, but this time screw full length. Put this end through a No. 41 hole drilled in the tank at position shown, put a nut on the inside, and tighten it, cutting off the superfluous thread close to nut, which effectually locks it, as the thread beyond the nut will be too distorted for the nut to slack accidentally. I often use that wheeze where nuts are a permanent fixture. Then put the pawl on, and see it remains free when the nut is right home. The springs are wound from 24-gauge steel wire; note, one pulls and the other pushes. If a spot of thin oil is applied to pawls and pivots, and the lever waggled back and forth, the ratchet-gear should work perfectly, clicking one tooth when the bottom of the lever swings about $\frac{3}{8}$ in. overall movement.

The lubricator is erected by attaching it to the front buffer-beam by a piece of $\frac{3}{8}$-in. by $\frac{1}{8}$-in. angle, $1\frac{1}{2}$ in. long. This is fixed across the front of the lubricator by three 3/32-in. by $\frac{1}{4}$-in. brass screws, nutted inside the tank, the angle being placed $\frac{3}{8}$ in. below the top of the tank and, of course, level; the ratchet-gear is on the right-hand side. Drill a No. 41 hole in the middle of the top of the buffer-beam, and $\frac{1}{4}$ in. from the edge, and another $\frac{1}{2}$ in. each side of it; countersink all three. Hold the lubricator in the position shown in the illustration, close to the beam and in centre of same; run the 41 drill through the holes, making countersinks on the angle; drill through No. 48, tap 3/32 in. or 7-B.A., and attach by three countersunk screws.

Make up an eccentric-strap to fit the smaller eccentric on the crank-axle, by exactly the same process as described for the valve-gear eccentric strap; but instead of slotting the lug, tap it $\frac{1}{8}$ in. or 5-B.A. Make up a fork or clevis, as described for valve-gear, but to the dimensions given in the detail sketch, and attach it to the ratchet lever by an 8-B.A. screw with $\frac{3}{16}$ in. plain under the head; this can be turned from a piece of $\frac{3}{16}$-in. steel rod. Connect up the fork and the eccentric strap by a piece of $\frac{1}{8}$-in. steel rod, the exact length of which can be obtained from the actual job. Put the eccentric at half-stroke, and the ratchet-lever vertical; measure distance between the end of the fork and the lug of the eccentric-strap, allowing about $\frac{1}{4}$ in. each end extra for screwing into lug and fork respectively. Screw the rod into the eccentric-strap, then disconnect the fork and screw it on; bend the rod slightly to clear the inside cylinder, and re-connect. The ratchet should click one tooth for every turn of the wheels; if it doesn't, and adjusting the fork on the rod doesn't produce the desired effect, shift the fork to a hole higher up the ratchet-lever. It is better for the pawl to overrun the teeth slightly, than risk missing a tooth; good lubrication is vital with superheated steam.

In Praise of Steam

(*Continued from page* 355)

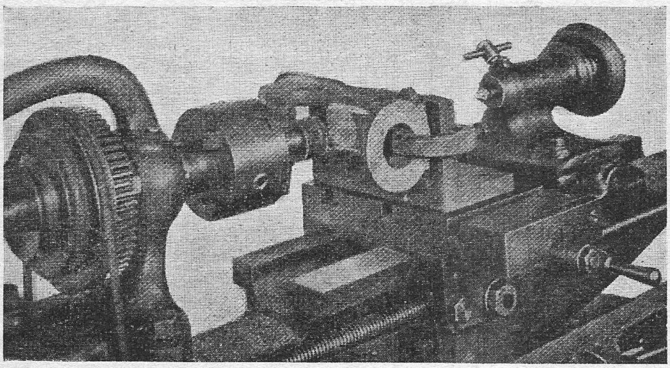
the Aveling traction for the love of the thing. I myself just failed in this direction, for my prize was a small Tasker portable, fifty-seven years old, and save for a few tubes, was in running order; but the man with the oxy-acetylene plant got there first. He did leave the wooden wheels behind, a sad reminder. However, there is standing down in my native village a shed containing a model Fowler traction my two brothers and I built in 1922, a pleasant reminder of the first MODEL ENGINEER Exhibition. It survived a near land mine, and a nearer phosphorus bomb, and we look forward to when, if friend Goodhand is still in our midst, he will make for us a new firebox which our engine badly needs.

*MILLING IN THE LATHE

By "NED" **Section 2—Milling Without Special Appliances**

A general review of the principles, appliances and methods employed for adapting the lathe for various types of milling operations

FURTHER examples of operations which can be carried out with the aid of an angle-plate or other vertical mounting fixture are shown in the two photographs on this page. Both operations are encountered in the machining of components for a well-known type of model horizontal steam engine. In the first case, the flat surface of the main casting, which forms the



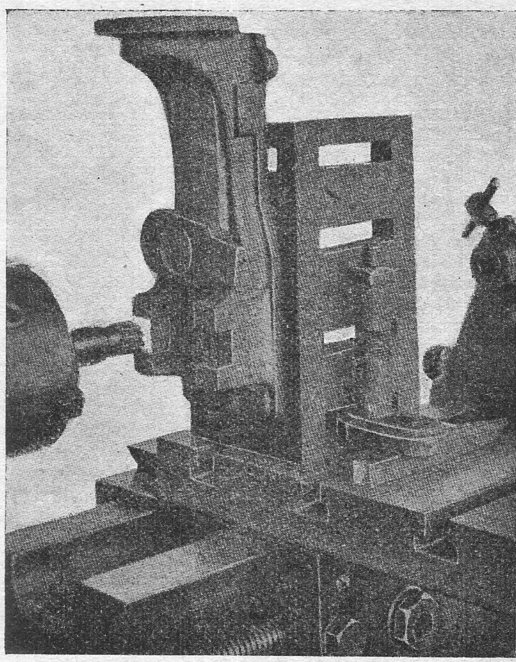
Milling crosshead guide bearing face of model steam engine

lower bearing surface for the crosshead slide, is being face-milled. The casting, having been filed or machined flat on the under surface, is clamped against the vertical face of the angle-plate by means of a pair of small G-clamps, the height being adjusted to bring the centre of the surface to be milled approximately level with the lathe centres, though this adjustment is not critical, so long as the cutter is slightly larger in diameter than the width of the milled surface.

This particular operation could have been dealt with by mounting on the lathe faceplate and using a facing tool, but as the surface is not symmetrical with the length of the casting, it would have called for a greater radius of swing and a wider gap than is usually provided in small lathes. The alternative methods of dealing with it would have been by shaping or filing, neither of which is quite so easy or convenient as milling for the average model engineer.

In the next photograph, the same casting is being dealt with, but in this case the operation consists of milling the slots for the main-bearing seatings. The angle-plate is in this case up-ended so that it rests on its side edges (care should be taken to see that these are square with the faces both ways) and is held down on the cross-slide by two toe clamps, which engage the slots of the angle-plate as shown. The casting is held to the angle-plate by a single bolt passing through a cored hole between the bearing standards, a strap being used to straddle the raised side edges. In this operation, height adjustment is more critical, but is easily set by tapping the casting into position before tightening the bolt. It is also possible to move the casting slightly, to adjust the width of the slots, in this way, should the end mill used be too narrow to form them in one cut; but it is better to avoid the necessity for this if possible, as it introduces a potential source of error.

If there is much metal to be machined out to form the slots, it is advisable to start with a smaller cutter, say $\frac{1}{16}$ in. less in diameter than the finished size, and use the correct size cutter to finish the sides. A large facing cutter should be used to face the tops of the bearing horns to pro-



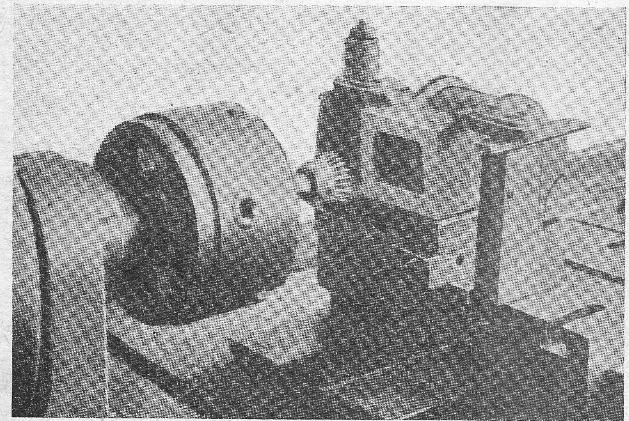
Milling bearing seatings of model steam engine

* *Continued from page* 310 "*M.E.*," *September* 26, 1946.

vide a flat surface for the keep plates or bearing caps. When setting up work of this nature, a centre line should be marked across the full width of the casting, and carefully checked up against a true-running point centre in the lathe for height and squareness.

Recessed Valve-chests

Some steam engines have an integral valve-chest in the main cylinder casting, with the slide-valve bearing surface sunk below the level of the joint face. In such cases, practically the only way to machine this surface is by end-milling, and it is frequently necessary to use an angular-sided or "dovetail" cutter, in order to reach undercut surfaces, and avoid leaving an untouched radius at each end of the limit of travel allowed by the aperture in the valve-chest.



Set-up for milling recessed slide-valve face of model steam engine cylinder

An operation of this nature is illustrated in the next two photographs, one of which shows the finished job and the cutter employed, while the other shows how the cylinder casting is set up on the lathe cross-slide. As the casting had a flat bolting face at right-angles to the slide-valve face, it was possible to clamp it directly to the cross-slide, with parallel packing underneath it to bring it to the correct height. The cutter used was a ready-made one which happened to be available, but a home-made end mill, either of the flat two-blade type or a more elaborate multi-toothed cutter mounted on a shank, would have served equally well.

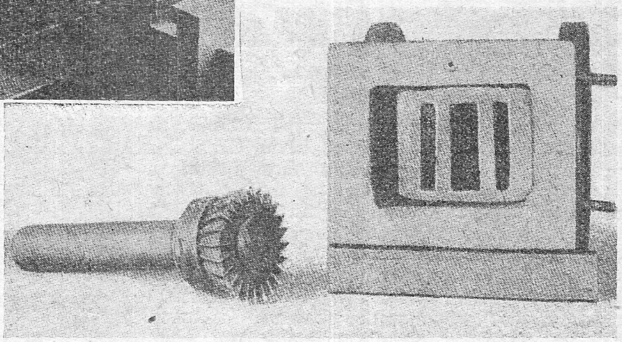
It may be observed that most model steam engines are made with a detached "picture frame" type of steam-chest, which makes it possible to machine the slide-valve surface much more easily; but similar machining problems to those involved in the above operation frequently crop up in model engineering practice, even if they do not occur in cylinder machining.

Side-milling Cylinder Ports

Before dismissing the subject of machining small steam-engine cylinders, reference may be made to a method of milling the ports in the slide-valve bearing face, which is less common than the end-milling method already described, but has advantages in certain circumstances. It consists in the use of a side-milling cutter, similar to a small slotting or Woodruffe key-cutter, which produces a crescent-shaped slot of limited depth in relation to its width, but generally deep enough for all practical purposes.

The cylinder is mounted on the lathe cross-slide, the bore axis being horizontal and the slide-valve face vertical, with the centre line of ports on the same level as the lathe centres. A convenient method of mounting is to clamp the block to the vertical side of an angle-plate by a single bolt passing through the bore. It is essential to use a cutter having a small shank diameter, to obtain the maximum depth of cut in relation to port width, and for this reason arbor-mounted cutters are generally unsuitable. Cutters formed integral with the shank are best, but it is practicable to extend the shank beyond the cutter, so that it can be supported by the tailstock centre. A standard Woodruffe key-seating cutter cannot be used unless the shoulder of the shank is turned away behind the cutter to provide extra clearance.

It will readily be seen that three ports (or more if necessary) can be cut simultaneously by this method, by "ganging" the three cutters, of appropriate width, and spaced at the correct distance apart, as shown in Fig. 20. Besides being quicker than end-milling, this method produces certain accuracy in the width and spacing of the ports, and has practical advantages for repetition work. The square-cut ends of the ports may be preferred to the rounded ends of ports produced by end-milling.



Cylinder with recessed slide-valve face, and cutter used for machining it

Screw-heading

Many operations such as the slotting, flatting, or squaring of screw heads can be carried out with the minimum of special equipment. The work can often be held in the lathe tool-post, with the aid of a vee packing strip, so that its centre is level with that of the lathe centres, but in many cases the provision of a simple chucking device

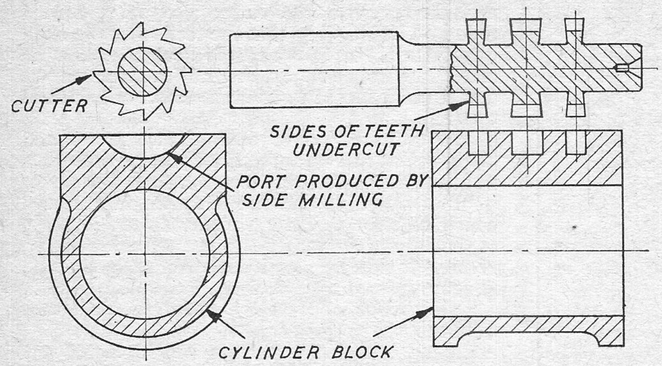


Fig. 20. Method of cutting ports in steam engine by side milling

It is possible to halve the number of operations needed for producing a square or hexagon, by using two cutters spaced a distance apart equal to the diameter across flats of the finished form. This is a very practical means of speeding up the operation, which is worth while in repetition work, but saves hardly any time in a "one-off" job, because it is necessary to set the work very carefully to ensure a symmetrical cut. If, however, the method is adopted, the best way to centralise the work is to turn a small projection on the end of it, to the diameter across flats and

will be found helpful. A cheap drill chuck, with a parallel shank, clamped in a split holder similar to that used for boring bars, will enable small-diameter screws to be held quite firmly enough for slotting the heads, and without damaging the threads where held directly by the chuck jaws, though obviously, a more elaborate screw chuck would be better. (See Fig. 21.)

For squaring heads of tool screws, or the shanks of taps, reamers, valves, etc., some simple

adjust the work for milling so that this part just passes between the cutters. After milling, the projection is, of course, machined away.

The type of cutter most suitable for milling flats, squares and hexagons on work of this nature is a "side and face" cutter of the appropriate hand. Where two cutters are used simultaneously, they should be of opposite hand. For occasional jobs, working on one side only, large-diameter end mills may be used, and an ordinary

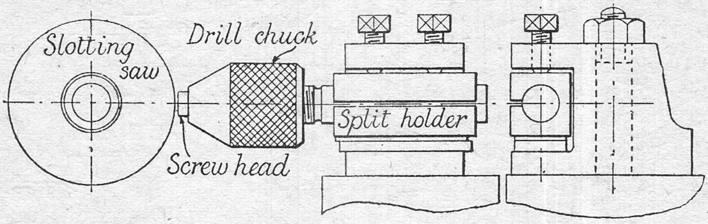


Fig. 21. Screw held in drill chuck, mounted in toolpost by means of a split holder, for slotting operation on head

method of indexing the work in four positions is obviously desirable. A very elementary device, which serves its purpose quite effectively, is to mount a square plate temporarily on the shank by any convenient means, such as by driving or soft-soldering it on. It need not necessarily be concentrically true with the shaft. By means of a square or spirit level, the four flats on the plate are successively located for milling the flats on the work, and the depth of cut is measured by means of the lathe top-slide index. Similar methods can, of course, be used for forming a hexagonal head on a valve cap or screw plug, by using a guide plate of appropriate shape, and in cases where the production of more elaborate indexing devices is not considered worth while, will be found reasonably accurate—at least, much more so than filing, unless the worker is very highly skilled in the latter art.

slotting cutter, without side teeth, is also quite serviceable if the sides are relieved by undercutting or concave grinding. As the direction of cutting thrust is mostly downwards, the work may be fed in from the front, with normal direction of lathe rotation.

The form of work-holding fixture shown in Fig. 14 (August 29th issue) will be found very useful for dealing with many jobs of the type now under discussion.

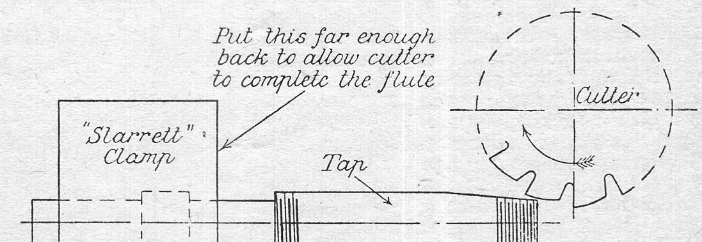


Fig. 22. Tap held on slide-rest of lathe for milling flutes

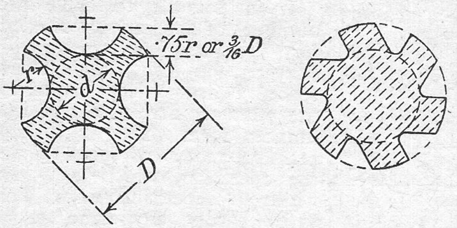


Fig. 23. Cross-section of standard four-fluted tap, and six-fluted master tap or hob, respectively

Fluting Taps and Reamers

These operations can also be carried out in similar manner to the above, holding the work in the lathe tool-post, or with suitable packing on the cross-slide, and using a cutter of appropriate shape. Indexing is not usually of very high importance in this work; indeed, irregular spacing of the flutes is often a practical advantage in preventing chatter in tools of this class.

A simple set-up for fluting a small tap is illustrated in Fig. 22. In order to locate the tap in the four positions for milling the flutes, a portion of the shank is left oversize in diameter, and this is filed square, the flats being taken down flush with the rest of the shank. (This is, of course, machined away after cutting the flutes, and before hardening and tempering the tap.)

A small machine vice or toolmaker's clamp can be used to hold the tap, the entire assembly being mounted on a flat baseplate on the top or cross-slide of the lathe, with the ends of the tap mounted on suitable packing blocks to raise it to the correct height for fluting. Soft metal or fibre packing blocks will be found best, and they may with advantage be vee-notched to assist in location and prevent them being shaken out under vibration. Before finally tightening the vice, bed the work well down on the packings by tapping with a hide or lead mallet.

It is always desirable to feed the work against the rotation of the cutter, so that in dealing with a job of this nature, it should be mounted at the back end of the cross-slide and fed towards the front. If this is not practicable, the work may be mounted at the front and the direction of cutter rotation reversed, the cutter also being turned round on its shank so that the teeth face the right way; but if this is done, it is best to mount the cutter in a collet chuck, or fix it in some way so that it cannot loosen under the effect of left-hand rotation.

The cross-section of the ordinary four-fluted tap is shown in Fig. 23, and this can be cut with a standard radius-forming tool. A three-fluted tap is often fluted to the shape shown in Fig. 24, which calls for a rather different form of cutter, as shown in the same illustration. It is, however, possible to flute taps with cutters of other shapes; in some cases it may be found possible to obtain a better shape of flute by offsetting the cutter from the centre line of the work.

Fig. 25 shows how an odd profile cutter was utilised to machine a four-fluted tap, and the photograph shows that the result achieved was quite satisfactory. Reamers or milling cutters may be fluted with a plain "side and face" cutter offset to produce a "ratchet" form of tooth. In dealing with all kinds of cutting tools, care should be taken to position the cutter in such a way as to produce rake and clearance angles of the correct "hand." It is very awkward to find, after spending a lot of time making a right-hand tap, that it cuts in a left-handed direction, or *vice versa*. Reamers will, of course, work equally well either way, but most operators will find it awkward to have to turn a reamer backwards in use; and such freaks may "lead one up the garden" if not understood beforehand. Some readers may, perhaps, remember pranks of apprentice days, when machine belts were reversed for fun, and the bewilderment which showed in the faces of the hapless victims before they "tumbled" to the trick.

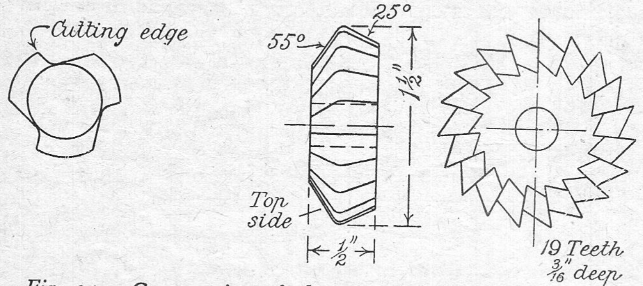


Fig. 24. Cross-section of three-fluted tap, and cutter used for fluting same

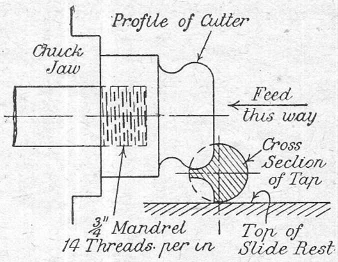
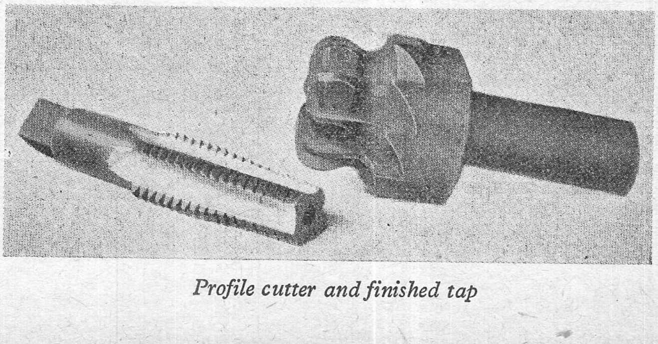


Fig. 25. Showing how a profile cutter can be used for tap fluting

(*To be continued*)



Profile cutter and finished tap

Flash Steam Topics

By W. Shearman

AFTER reading the articles by Mr. Cockman and others in THE MODEL ENGINEER, published during 1943, I feel that I really must chip in. Oh yes! I know a long time has elapsed since those excellent articles appeared, and I beg your forgiveness.

In the first place it appears to me that the chief trouble experienced by the owners of the really fast boats has been the seizing of valves and pistons, due no doubt to carbon from oil burnt by the excessive temperature of the steam used. If we can maintain a high pressure and quantity without excessive temperature the above troubles will be ended. To accomplish this I suggest using a much less ferocious type of burner, and a throttle and safety valve on steam pipe, together with water release valve between pumps and boiler check valve. This, together with a variable *delivery* (not stroke) pump should, I think, be capable of being adjusted to maintain anything in the region of 600 lb. in the boiler and, say, 550 in the engine steam-chest, without the steam being too hot and causing the cylinder-heads to glow dull red whilst running! Here is a brief description of a plant designed on these lines by the writer and built just prior to the war, which catastrophe prevented its completion and testing.

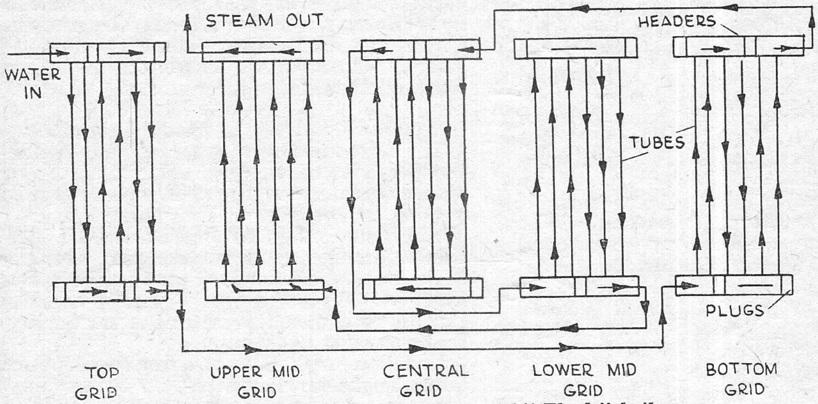


Fig. 1. Diagram of circuit of model "Flash" boiler

Engine

$\frac{3}{4}$-in. by $\frac{3}{4}$-in. single-acting twin horizontally-opposed, uniflow exhaust, poppet inlet and exhaust-valves, steam inlet cut off at 1/3 stroke. Designed for maximum pressure of 400 lb. (shown at MODEL ENGINEER Exhibition, 1937), gives an indicated h.p. around two at 3,000 revs. The burner is a flat rectangular pan type, vaporising. Burning paraffin at 5 to 20 lb. sq. in., and giving vertical orange-blue flame over an area 9 in. by 4 in. from single "Primus" nipple.

Boiler

Five grids, comprising $\frac{1}{4}$-in. O.D. by 20-g. solid drawn steel tubes 9 in. long brazed into $\frac{3}{8}$-in. O.D. steam barrel headers in rows of 6. Plugs being arranged to give 2, 3 or 6 tubes in parallel, according to position of grid in the boiler circuit. (See sketch, Fig. 1.) It will be seen from the sketches that the circuit starts with two tubes in parallel where the water enters and so up to 3rd grid, then 3 tubes in parallel as far as last grid, which has 6 in parallel. The reason for this arrangement is that as the water and steam pick up the heat they expand and require more room in which to circulate. This also tends to keep the linear velocities down and prevent "Bulleting"; a common fault of the mono-tube boilers. At the same time the water and steam have more time in which to pick up heat. The "stacking" of boiler grids is arranged as in sketch Fig. 2; the numbers indicate the number of tubes in parallel in each grid and dotted lines the connections between grids. Since the tubes are only 9 inches long, the linear length of the boiler is only about 5 ft., though the unit contains more than 22 ft. of tubing!

Commencing at the pump delivery, there are (1) hand-pump barrel with isolating cock; (2) spring - loaded release or spill valve; (3) check-valve. On outlet end of boiler there are (1) safety-valve; (2) screw-down throttle valve (key adjusted); (3) on-off rotary disc starting throttle valve.

The hand pump has no valves of its own, for being of large capacity I have found the mechanical pump's valves and boiler check-valve serve quite well despite the distance between them. The ram is fitted with reversed cup-leathers and pumps air as well as water!

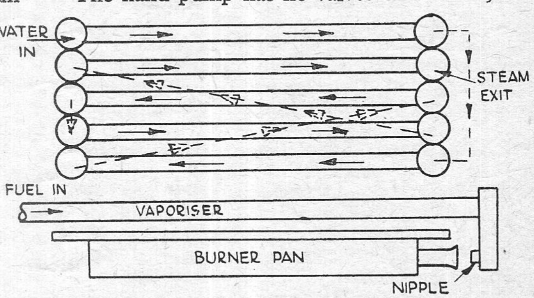


Fig. 2. Elevation sketch of model "Flash" boiler

I trust this description will be of interest to "Flash" fans and provide a little food for thought.

Clubs

The Junior Institution of Engineers

Friday, October 11th, at 6.30 p.m., 39 Victoria Street, S.W.1, Ordinary meeting. "Engineering Aspects of Atomic Energy," by Dr. H. Chatley (Member).

North Western Section—Monday, October 14th, at 7.0 p.m., Manchester Geographical Society, 16, St. Mary's Parsonage, Manchester. Annual General Meeting, followed by Presidential Address. "Light and Colour," by L. H. A. Carr, M.Sc. (Tech), M.I.E.E., A.R.P.S. (Member).

Sheffield Section.—Wednesday, October 16th, at 7 p.m., Meeting, in Lecture Room of Leeds University, "Steel and the Engineer," by A. Roebuck (Member and President, Sheffield Section).

Friday, October 18th, at 6.30 p.m., 39, Victoria Street, S.W.1, Informal meeting, "Atmospheric Railways," by L. P. Walter (Member). Slides.

Sheffield Section.—Friday, October 18th, at 7 p.m., Annual General Meeting, Metallurgical Club, West Street, Sheffield. "The Schneider Air Contests," by E. Scott.

Friday, October 25th, at 6.30 p.m., 39, Victoria Street, S.W.1, Informal meeting. "Water Pumping Machinery," by H.K. Hewitt (Member). Slides.

Friday, November 1st, at 6.30 p.m., 39, Victoria Street, S.W.1, Discussion Groups. "High Temperature Insulation," to be opened by R. L. Ballard (Assoc. Member).

Western Group of Members.—Friday, November 1st, at 7.30 p.m., Merchant Venturers Technical College, Unity Street, Bristol. "Geology in Engineering," by F. L. Daniels, M.I.Mech.E., F.G.S. Slides.

Friday, November 8th, at 6.30 p.m., 39, Victoria Street, S.W.1, Ordinary meeting. "Sugar Beet and Engineering," by H. W. Arkell (Member).

Saturday, November 9th, at 7.0 p.m., Annual Dance to be held in the Paviour's Arms, Page Street, S.W.1.

Friday, November 15th, Annual General Meeting.

Friday, November 22nd, at 6.30 p.m., 39, Victoria Street, S.W.1, Informal meeting, "The History and Development of the Oil Shock Absorber," by A. E. Bingham (Member).

The Kent Model Engineering Society

A "OO" gauge layout is to be constructed at the Society's headquarters in the near future. This layout has been planned by two of our junior members, Messrs. N. Berry and K. Clarke, who have already completed a quantity of rolling stock and track.

The layout will occupy a space 21 ft. × 9 ft. and will be built in three levels.

For the Society's regular weekly meetings the following have been arranged :—

October 14th—A 1-in. scale "Atlantic" locomotive, by Mr. V. Wattingham. October 21st—Mr. S. P. Smith will describe the machinery and equipment of a destroyer. October 28th—Discussion on the design of Passenger-carrying Tracks.

New members and visitors are always welcome at any of our meetings.

Secretary : A. F. BROCK, 342, Green Lane, New Eltham, S.E.9. (Telephone ELT. 2342.)

Mancunian Model Engineering Society

Members, old and new, should bring along their model engineering friends on Friday evenings, 8 p.m., to our meetings at the Girls' Institute, Mill Street, Ancoats (next to Ancoats Hospital). Lone hands are invited to come along and join us, and share the communal knowledge which only a society can offer.

Hon. Secretary : J. MEADOWS, 90, Bank Street, Clayton, Manchester 11.

Oldham Society of Model Engineers

At our last meeting we had a very interesting lecture on building a caravan. Coming attractions are:—

October 11th—Lecture by Mr. W. Tetlow. October 25th—Mr. W. Ogden will lecture on Power Boats. November 8th—Mr. Barnett gives a lecture on Engineering Materials.

Hon. Secretary : W. K. BUCKLEY, 87, Lyme Terrace, Highfield, Mossley, Lancs.

Leicester Society of Model Engineers

The next meeting will be held on Tuesday, October 14th, at 9, Wellington Street, at 7-0 p.m., when a short lecture, title to be announced at the meeting, will be given by a member.

The visit to Myford Engineering Co. Ltd., Beeston, arranged to take place on September 21st, had to be postponed owing to the lack of suitable transport. This will now take place on Saturday, October 19th, members meeting at the Society's headquarters at 2.15 p.m.

Hon. Secretary : E. DALLASTON, 67, Skipworth Street, Highfields, Leicester.

The Society of Model and Experimental Engineers

The next meeting will be held at 39, Victoria Street, Westminster, S.W.1, on Saturday, October 12th, at 2.30 p.m., when S/Ldr. R. M. Cracknell, M.B.E., will give his lecture, "The I.C. turbine for aircraft jet propulsion." The attention of members is directed to this lecture, which is to be an authoritative description of the latest developments in jet propulsion.

Particulars of the Society may be obtained from the Secretary : J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

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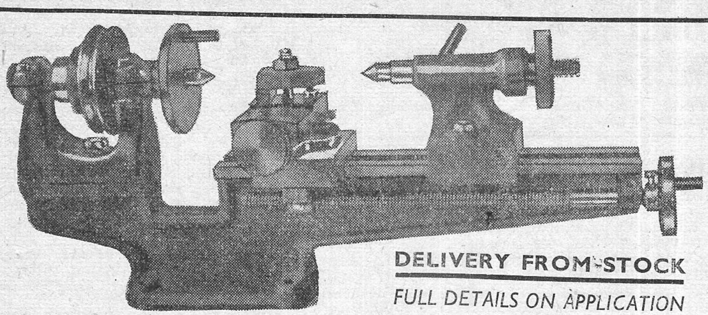

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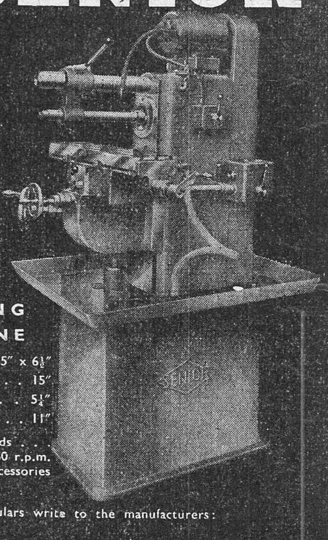

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